Monetary Policy and Trade in the Euro area: The Effect of Market Concentration*

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Abstract

This paper studies how heterogeneity in market concentration and firms' productivity distributions affect monetary policy transmission within a monetary union. I provide empirical evidence that French exporters engage in dynamic price discrimination across Euro area destinations following a monetary policy shock, adjusting prices more significantly for core Euro area countries than for the periphery. This price discrimination is linked to differences in market competition and is partially explained by heterogeneity in firm concentration and productivity distributions across country-sector destinations. The effects remain strong even when using aggregate bilateral trade flows. Additionally, I present evidence of a selection mechanism where unproductive firms exit or enter the market after the shock, with the new cutoff productivity reacting more in markets with more concentrated or skewed distributions. To rationalize these empirical findings, I develop a two-country monetary union model of international trade with nominal wage rigidities and imperfect international risk-sharing. The selection mechanism leads to asymmetric changes in the elasticity of demand across countries with different firm distributions. In line with the empirical analysis, a contractionary monetary policy shock leads to lower markups, producer price index and import prices, higher output in the more concentrated economy, and a decrease in its bilateral trade balance.

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Keywords: Monetary policy, Monetary union, Market concentration, Firms distributions, Trade.

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1 Introduction

In this paper, I study how heterogeneity in market concentration and firms' productivity distributions affect monetary policy transmission within a monetary union. The possibility that Euro area monetary policy propagates differently across member countries is widely recognized as a major threat to its smooth and effective transmission. Recent evidence suggests that credit channels and household liquidity can lead to heterogeneous monetary policy transmission (Corsetti et al., 2022; Calza et al., 2013; Gilchrist et al., 2023). To address this issue, specific instruments have been deployed to mitigate the risk of "financial fragmentation," namely, the heterogeneous responses of credit spreads to changes in key policy rates. Surprisingly, however, little is known about the heterogeneity in monetary policy transmission due to frictional goods markets and their variations across the region.

A well-documented feature of the Euro area is the heterogeneous distribution of highly productive firms and levels of market competition across member countries (Bighelli et al., 2023; Gorodnichenko et al., 2018; Berlingieri et al., 2017). These disparities, largely resulting from institutional factors, lead to diverse economic outcomes within the EMU. Yet, there is limited evidence on whether such differences affect the transmission of monetary policy across member states. Moreover, the adoption of a common currency has facilitated trade (Glick and Rose, 2016; Baldwin, 2006), increasing interdependence and potentially amplifying the dynamic role of productive exporting firms on monetary policy transmission. This paper precisely examines how heterogeneity in market concentration affects monetary policy transmission, with particular emphasis on the role of trade.

To study this relationship, I proceed in three steps. First, I empirically demonstrate that market concentration – specifically, the distribution of firms in each country-sector – affects how French exporters' prices respond to monetary policy shocks across Euro area destinations. The asymmetric adjustment of prices based on market concentration signals changes in competition within each destination market. Second, I provide evidence that the productivity composition of firms changes differently after a monetary policy shock, depending on the concentration or skewness of the firm distribution in each market. This indicates a heterogeneous selection effect across countries-sectors following a monetary policy shock. Third, I construct a two-country monetary union model of international trade and monetary policy transmission that rationalizes my empirical findings and provides insights into output and trade dynamics. The model combines heterogeneous movements in firms' productivity across two economies with varied adjustments in each country's elasticity of demand leading to dynamic pricing-to-market behavior.

This paper makes several novel contributions to the literature on monetary policy transmission and international trade within a monetary union. It is the first paper to identify and empirically demonstrate dynamic price discrimination across countries within a monetary union following a monetary policy shock. Using French customs data, I show that the concentration and skewness of firms' productivity distributions partly explain this behavior. By focusing on exports from a single country to multiple destinations, I control for changes in marginal costs post-monetary policy shock, allowing price responses to serve as proxies for shifts in competition. Furthermore, by using aggregate trade unit values (a proxy for prices) of each product in bilateral trade relationships across the Euro area, I reveal that these results are consistent with broader movements in unit values, underscoring the significant role market concentration plays in intra-Euro trade. This demonstrates that dynamic price discrimination has aggregate effects, extending beyond French exporters and providing novel evidence relevant to both macroeconomics and international trade.

The mechanism underlying the dynamic price discrimination is the selection of firms for production and exports, as is common in trade theory, and this paper further contributes by exploring it empirically and theoretically. I provide new empirical evidence that the shape of the firm distribution influences productivity changes after a monetary policy shock, leading to different magnitudes of the selection effect across markets. The paper presents a two-country monetary union model where the shape of the firm distribution significantly impacts markup adjustments driven by this selection effect. Productivity changes vary across markets, altering competition dynamics and resulting in differing movements in demand elasticity, which cause heterogeneous markup adjustments. Moreover, the model incorporates the interdependence of the selection effect through trade dynamics. It demonstrates that competition in one market can impact the profitability and competition levels of the firms in the foreign market. To the best of my knowledge, this is the first paper to integrate asymmetric price adjustments—driven by competition and trade dynamics—within a monetary union framework. By bridging the gap between these two areas of research, it provides a more comprehensive understanding of how monetary policy is transmitted in a heterogeneous monetary union.

My first key result is the existence of asymmetric price adjustments by French exporters across destinations, influenced by market concentration. Specifically, I find that even a year after a monetary policy shock, French exporters adjust their prices more intensively in the Core countries (Belgium, Germany, and Netherlands) than in the Periphery (Spain, Portugal, and Italy). These differences are large and statistically significant, underscoring the importance of this channel for monetary policy transmission. The concentration of destination sectors partly explains these disparities. Interestingly, exporters adjust their prices more in markets with higher concentration – that is, markets with a higher share of very productive firms. By focusing on the largest French exporters that consistently trade with nearly all Euro area countries, I control for potential movements in marginal costs at both the country and firm levels. This approach indicates that the observed price adjustments are due to changes in competition: exporters lower their markups more in markets where competition has increased, preventing them from maintaining high markups.

Repeating the analysis of bilateral trade flows within the Euro area, I find similar effects on aggregate unit values across reporter-partner-product relationships. First, the trade unit values of the same products destined for core countries respond more than those destined for the periphery. Second, following a contractionary monetary policy shock, the cumulative decrease rate in unit values is greater in markets with higher concentration. These results provide evidence that asymmetric price adjustments may have aggregate effects on unit values and confirm the previous findings beyond transactions originating only from France.

The second key finding relates to the selection mechanism within each destination market. Dynamic price discrimination – driven by competition and monetary policy – must be understood in the context of these markets. By focusing on the selection mechanism and its dynamic relationship with monetary policy shocks, I find that in more concentrated markets, the firms that survive are even more productive, leading to a stronger selection effect. This connects the empirical results: French exporters need to reduce their prices more intensively in markets where surviving firms are more productive and competitive.

To rationalize these empirical findings, I build a two-country monetary union model, drawing on Melitz and Ottaviano (2008) and incorporating wage rigidities. This framework allows for quasi-linear preferences, enabling endogenous and heterogeneous markups that depend on a firm's productivity and the level of competition in the destination market. The model departs from the law of one price, as firms can set different prices in domestic and foreign markets based on the destination's cutoff productivity, which is linked to competition. It also includes an entry-exit selection mechanism for firms, as in Melitz (2003). A contractionary monetary policy shock triggers the selection mechanism, leading to the exit of less productive firms and changing the cutoff productivity. Following a contractionary monetary policy shock, surviving firms face more productive competitors, which increases competition. Together with reduced demand, this leads to lower markups. However, the magnitude of the selection mechanism varies depending on the skewness of the productivity distribution, leading to heterogeneous movements of the cutoff productivity. This directly affects the elasticity of demand in each market, resulting in greater movements of demand elasticity and markups in more concentrated markets. Therefore, the model successfully replicates the empirical results, showing that French exporters adjust their prices heterogeneously across countries.

By introducing a two-country dimension and moving beyond a standard small open economy framework, I capture the interdependencies inherent in a monetary union. Productivity or demand shifts in one country affect the other economy through trade channels. I find that a small open economy model that ignores these interdependencies underestimates the effect of monetary policy on markup adjustments and fails to match the empirical findings. Thus, the two-country monetary union with trade linkages explains a larger portion of the markup-price variation arising from trade and common monetary policy inefficiencies.

Additional results emerge from the model's predictions. Beyond the *intensive margin* of the selection effect – which concerns changes in the productivity of existing firms – there is an *extensive margin* involving differential rates of firm entry and exit in both the domestic and the foreign markets. These dynamics influence the trade balance and the overall economic impact. Ultimately, following a contractionary monetary policy shock, the model predicts lower output in less concentrated markets but a higher trade balance. The improvement in the trade balance is driven mainly by a larger decrease in imports in these less concentrated (and less productive) economies. Conversely, firms in more concentrated markets become temporarily more productive, leading to greater production efficiency and higher output.

The model predicts that asymmetric price adjustments and the selection mechanism directly affect relative prices. A monetary policy shock leads to more intense price adjustments in more concentrated markets, which, in turn, affects relative prices. Specifically, following a contractionary monetary policy shock, the producer price index is temporarily higher in less concentrated markets before converging to a steady-state ratio.

I test the model's predictions, and the results are consistent with the theoretical outcomes. By applying local projections on country-sector data related to output, prices, and trade balances, I find that market concentration significantly affects these macroeconomic variables. Specifically, the producer price index and output respond more strongly in more concentrated markets, while trade balances tend to decrease. This suggests that the model effectively replicates aggregate movements across countries, and its mechanisms may play a significant role in explaining asymmetric responses.

The remainder of the paper is structured as follows. Section 1.1 discusses the contributions with respect to the existing literature. Section 2 uses customs data and studies monetary policy effects on prices. In Section 3, I model a two-country monetary union economy that contains all the necessary mechanisms to replicate the results of the empirical part. Section 4 simulates the model, while Section 5 concludes.

1.1 Related Literature

This paper contributes to the empirical macroeconomic and trade literature on a monetary union. Using transactions data from French firms, I identify the effect of monetary policy shocks on export prices of goods within the Euro area. The literature lacks studies on how export prices are affected by a monetary policy inside a monetary union. Goldberg and Verboven (2005) show that in the car industry, prices in the Euro area converge to the law of one price. On the other hand, Fontaine et al. (2020) demonstrate substantial price discrimination across the Euro area, which has not diminished during the last two decades. Moreover, Berman et al. (2012) show the effect of exchange rates on export prices and how firms' productivity can affect the responses. In this paper, I use monetary policy shocks to study their effects on the export prices of exporters to Euro area destinations. The main focus is on price changes with different intensities across countries in the short-medium term and the role of the market concentration.

I contribute by showing the existence of dynamic price discrimination across the Euro area destinations. Importantly, I demonstrate that this dynamic price discrimination can be partly explained by the country-sector concentration or productivity distribution in the destination market. To my knowledge, this is the first paper to show that firms' distribution and concentration at the destination market can explain dynamic price discrimination indicating signs of heterogeneous monetary policy transmission. Dedola et al. (2023) show that the pass-through of corporate tax increases is higher in destinations with greater producer and retailer market power in Germany. Furthermore, I use local projections as in Jordà (2005) with customs data to provide evidence of dynamic effects on trade. I use a specification that allows the study of price changes using custom-transactions data.

Moreover, the model contributes to a wide and recent literature of macroeconomic models with endogenous firm entry and exit, heterogeneous firms, and variable markups. There is a need for firm heterogeneity and trade as in Melitz (2003) with firm entry and exit. Bilbiie and Melitz (2020) study the effect of the extensive margin mechanism (firm entry) on monetary policy. Similarly, Bergin and Corsetti (2008) show the significance of this mechanism for the economy. Castillo-Martınez (2018) introduces wage rigidity in similar preferences to this paper and studies the effect of sudden stops on exchange rates and productivity in a small open economy. In my model, I incorporate wage rigidities by including two additional layers of firms, allowing for the dynamics of the standard New Keynesian model. At the same time, I study the effects of monetary policy inside a monetary union.

Furthermore, Corsetti and Dedola (2005) build a model of international price discrimination resulting from additive distribution costs. This paper is highly relevant to my model, as it deviates from the law of one price. Bilbiie et al. (2012) introduce heterogeneous firms with firm entry and exit and study the optimal monetary policy in that environment. My model contributes to this literature in several ways. First, I study a common currency environment where countries have dissimilar productivity distributions. Second, I introduce quasi-linear preferences with wage rigidity to study the effect of monetary policy on the economies and trade, involving a homogeneous shock with asymmetric effects on the countries. Third, exporters enter and exit each market, and the endogenous cut-off productivity for exporting firms may decrease or increase, leading the most productive firms to enter or exit the foreign market. A paper that studies this mechanism in a closed economy within a New Keynesian framework is Colciago and Silvestrini (2022), where they use the selection mechanism as in Melitz (2003).

Additionally, I study how monetary policy affects industrial production and trade balances at the country-sector level based on their productivity distribution and concentration. In this way, I show that the additional results of the model are consistent with empirical evidence. Peersman and Smets (2005) investigate industry characteristics, such as the durability of goods produced and financial structure, to explain the variability in policy effects across industries. Moreover, Hayo and Uhlenbrock (2000) provide evidence of asymmetric regional effects of monetary policy shocks in Germany before the Euro. Ganley and Salmon (1997) show the pattern of manufacturing sector responses seems correlated with the size characteristics of the firms in each sector. In particular, sectors that mainly comprise small firms tend to exhibit a stronger reaction to monetary shocks than sectors with larger firms. Auer et al. (2021) show that more indebted industries adjust their production more firmly after a monetary policy shock. In this paper, I study how differences in market concentration and productivity distributions can lead to asymmetric effects of monetary policy. Using local projections and high-frequency monetary policy shocks, I provide new findings. Furthermore, I investigate the existence of asymmetric effects of monetary policy on intra-Euro area trade.

2 Empirical Analysis

In this section, I present empirical evidence on how firm concentration and productivity distribution influence the heterogeneous transmission of monetary policy within the Euro area. The analysis proceeds in three steps. First, using French customs data and country-sector information, I show that French exporters adjust their prices more intensely in more concentrated country-sector destinations following a monetary policy shock. Second, by examining aggregate yearly bilateral trade flows, I find that the patterns observed in the French customs data are consistent at the aggregate level – that is, the movement of trade unit values after a monetary policy shock depends on the concentration of the destination market. Third, focusing on country-sector productivity data, I provide evidence of a heterogeneous selection mechanism driven by market concentration.

2.1 Customs Data

To investigate heterogeneous competition dynamics in the Euro area, I examine how monetary policy asymmetrically affects export price movements (unit trade values). Specifically, I assess whether export prices change differently across Euro area destinations and whether the concentration or productivity distribution of firms plays a role. Focusing on a single country's exporters – French exporters – allows for controlling movements in marginal costs within a country and among firms. This approach enables me to attribute the main results primarily to firms' markup adjustments.

I use French customs data as in Bergounhon et al. (2018). The data contain extensive information on the export transactions of French firms. More specifically, I have access to monthly seller-buyer-product transaction-level data, which includes information on the transaction's destination. The product classification is based on the NC8 product classification. Moreover, for each transaction, there is information on its value, and the associated units/kgs. All values are reported free-on-board (FOB). As discussed in Bergounhon et al. (2018); Fontaine et al. (2020); Berman et al. (2012), the data exclude French exporters with an annual export value of less than 150,000 euros. Therefore the very small exporters are not included in this analysis.

The French customs data are ideal for my analysis. First, they contain firm-to-firm transactions at a monthly frequency. This allows high-frequency monetary policy shocks to be used to study the short- and medium-term impact on prices. Moreover, the firm-to-firm transactions allow me to control for heterogeneity across firms in the destination market, closely following the movement of prices for each product and destination firm. Furthermore, I can control for past price changes that impact when firms adjust prices. Second, France is one of the largest economies in the Euro area, and the data contain an adequate number of exporters and observations. Therefore, the final dataset includes many observations even after the necessary cleaning steps. Third, the dataset spans a wide time range, making it suitable for my analysis.

Although NC8 is a specific product classification, there can be measurement issues or unobserved heterogeneity. To address measurement errors, I drop all the transactions with a value less than or equal to 100 euros, since when a transaction is less than 100 euros, it is usually rounded to 100. Furthermore, I drop all the transactions related to product codes where in at least 5% of the transactions, the monthly price is more than 250% or less than 40% of the median price over 12 months for the specific exporter [1]. The rationale is that if the price is systematically different from the median price in 12 months, the product code may not be homogeneous, which can affect price changes, especially across countries. In such cases, it is possible that there is an adjustment in the quality or composition of goods in the transaction. Such considerable price variance cannot be justified at a seller-product level in the Euro area and is a sign that the product's composition is not stable. Moreover, I drop all the transactions where the price change over the next 16 months for the specific buyer-seller-product relationship is over 200% or less than -66%. This affects a minimal number of observations and guarantees that there are no considerable spikes in price changes.

[1] The threshold is not too high, given that Kaplan and Menzio (2015) show that price dispersion of very specific products can vary a lot.

Although I use this cleaning procedure for the main results, stricter or more relaxed constraints [2] do not change the results.

2.2 Concentration and Firm Distribution

To capture differences in productivity distributions across countries and sectors, I use data from CompNet (Haug et al., 2022) and Amadeus focusing on the manufacturing industries. CompNet provides country-specific data on firms' productivity distributions for each NACE (2-digit) industry, including values for skewness, mean, and various percentiles (1st to 99th) of total factor productivity (TFP) using four different methods. It also offers Herfindahl–Hirschman Index (HHI) measures for market concentration using four different metrics.

For each NC8 product code in the customs data, I identify the corresponding industry. This mapping allows me to associate the characteristics of competitor firms' distributions in each destination market. I proceed in two ways: first, by directly incorporating skewness or the HHI in the estimation; second, by estimating the shape and scale parameters of a Pareto distribution (as assumed in the model) using the simulated method of moments to match various distributional values. The two Pareto-related parameters are the shape and the scale. The scale parameter is related to the minimum value of productivity in the firms' distribution, while the shape parameter is related to the inverse of the skewness and concentration.

While comprehensive, CompNet data may present comparability issues due to differences in data collection rules and procedures across countries.[3] Additionally, the TFP estimation is conducted separately for each country, potentially affecting cross-country comparability. To mitigate these issues, CompNet provides weighted variables, which I use for my analysis. To further address sample selection concerns and missing observations in the early periods of the sample, I include country and industry fixed effects and their interactions with the monetary policy shock, and I perform supplementary analyses using the mean values of variables over the entire period.

Alternatively, I use Amadeus firm-level data to estimate TFP using the methodology of Ackerberg et al. (2015). This approach allows for the direct estimation of productivity distributions, ensuring that the production function is consistent across firms within a sector, regardless of country, thus enhancing TFP comparability. While the Amadeus data cover a shorter period (2013-2019), they serve as a reliable proxy for persistent differences between countries and sectors captured by the Pareto parameters.[4] Notably, the measures derived from CompNet and Amadeus are com-

[2] For example, if we use a 15% threshold for the first step.

[3] As noted on the CompNet website: "The user must be aware that small differences in data collection rules and procedures across countries may exist and are out of CompNet's control. Nevertheless, comparability issues appear to be limited."

[4] Historical ORBIS provides data over a broader range of years, but the period covered by Amadeus is sufficient

parable, with estimated shape and scale parameters showing very similar values across the two datasets.

Using both datasets enriches the analysis by providing different perspectives. The Amadeus data enable the estimation of time-invariant shape and scale parameters of the Pareto distribution, facilitating direct comparisons across countries and sectors. Conversely, CompNet's detailed yearly information allows for the examination of time-varying variables and market concentration through the Herfindahl–Hirschman Index (HHI). Descriptive statistics are presented in Appendix A .

2.3 Monetary Policy Shocks

I use the monetary policy shocks series from Jarociński and Karadi (2020), which are based on changes in the overnight index swap rate (OIS) during ECB announcements. They disentangle an information shock and a monetary policy shock based on the co-movements of OIS rates and stock price indices around the time of policy announcements. I use the monetary policy shock series at monthly frequencies for the period 2002-2016.

Recent literature (Gertler and Karadi, 2015; Altavilla et al., 2019) uses a 'high-frequency identification' scheme to identify monetary policy shocks. They use changes in policy rates during monetary policy announcements as an external instrument. This approach allows researchers to isolate the immediate effects of monetary policy decisions from other concurrent economic influences. By focusing on the period surrounding these announcements, they aim to capture the pure reaction of financial markets and the economy to policy changes. This methodology provides a clearer understanding of the impact of central bank actions on variables such as interest rates, asset prices, and exchange rates, enhancing the accuracy of the empirical findings.

The existence of unconventional monetary policies and the information channel, as discussed by Melosi (2017), necessitates disentangling the information channel from policy shocks to understand their distinct effects. Jarociński and Karadi (2020) disentangle the information channel from changes in the OIS rate with a 3-month maturity. Therefore, there are two series: one related to the information channel and one related to the pure monetary policy shock. Furthermore, as explained in Altavilla et al. (2019), shocks in short maturities are a better proxy for the conventional monetary policy shock, which is the focus of this study.

I use the "poor man's proxy" shocks, defined as the change in the 3-month maturity OIS rate during monetary policy announcements. The monetary policy shock is measured in percentage points (100 basis points). Therefore, unless stated otherwise, all coefficients relate to the effect of a one percentage point monetary policy shock. Regarding summary statistics, the standard deviation

for capturing consistent patterns.

of the monetary policy shock is approximately 3 basis points. However, there are announcements with shocks as large as 16 basis points.[5] See Appendix A for details.

2.4 Local Projections

To proceed to the estimation, I use local projections, initially developed by Jordà (2005), to study the dynamics of French exports after a monetary policy shock. In this way, I can investigate the dynamic effects of monetary policy on the prices of French exporters. More specifically, I am interested in possible asymmetric effects across the Euro area countries.

Recent literature (Plagborg-Møller and Wolf, 2021) demonstrates that using an external instrument can facilitate the analysis of the dynamic effects of shocks without relying on vector autoregressions (VARs). Local projections, in particular, enable examining monetary policy effects in panel data while accommodating interactions, fixed effects, and non-linearities. This versatility makes them well-suited for the objectives of this paper. I am following the approach of previous studies focusing on firm-level data to adapt my specification on the customs data (Cloyne et al., 2023; Jeenas, 2018).

$$y^*_{i,b,p,t+h} = FE + \sum_{c=1}^{C} \alpha_{c,h} \mathbf{I}[b \in C]\epsilon^m_t + \beta_h Conc_{c,n,t-12}\epsilon^m_t + \sum_{j=1}^{3} \gamma_{j,h} y_{i,b,p,t-j} + u_{i,b,p,t+h} \tag{1}$$

Where the dependent variable $y^*_{i,b,p,t+h}$ is the cumulative price change ($\frac{p_{t+h}-p_{t-1}}{p_{t-1}}$) of exporter i to buyer b for product p. Moreover, I include three lags of the price change $\frac{p_{t-i}-p_{t-1-i}}{p_{t-1-i}}$. I include country $fC_{c,h}$, seller $f_{i,h}$, and product fixed effects $fP_{p,h}$ in the local projections (included in FE). I add the interaction of the destination country dummy with the monetary policy shock $\mathbf{I}[b \in C]\epsilon^m_t$ and the interaction of the concentration/productivity distribution variables of the destination country-sector with the monetary policy shock $Conc_{c,n,t-12}\epsilon^m_t$. I focus on the coefficients $\alpha_{c,h}$ and β_h, which account for the interaction of the country and country-sector-specific productivity variables with the monetary policy shock.

Using lag-augmented local projections (including lags of the dependent variable) not only renders inference more robust but also simplifies standard error calculations by avoiding residual serial correlation adjustment, as shown by Montiel Olea and Plagborg-Møller (2021). For the results presented, I use the heteroscedasticity-robust (Eicker–Huber–White) standard errors. However, applying two-way clustering on destination-country and year, or using simple standard errors, yields very similar results.

[5] Equivalent to 0.164 percentage points.

Not all exporters ship to every country every month. Moreover, different types of exporters behave differently and account for varying proportions of total exports. Although the dataset is unbalanced, I take several steps to achieve more accurate results. First, I keep only exporters that ship to at least five out of the seven countries considered each year (Austria, Belgium, Germany, Spain, Italy, the Netherlands, and Portugal). Second, I create a categorical variable based on each firm's total annual export value and interact it with the country and the monetary policy shock. This approach captures the firms responsible for most exports, which are consistently present in the data and less likely to exit. Third, including lags of the dependent variable ensures that the transaction between the French exporter and the buyer is active for at least three consecutive months before the shock, while accounting for recent price changes. This step reduces the number of observations entering the estimation but enhances the reliability of the results. Additionally, I repeat the analysis using lower frequencies by aggregating the monetary policy shocks and constructing prices over 3-month moving periods. This last exercise also provides robust evidence for information shocks.

The categorical variable relates to each firm's total value of exports within the Euro area. I assign the firms with more than 10 million euros exports per year to the group of the biggest firms. Literature has shown that more productive firms export more and more consistently. Therefore, this variable is used as a proxy for firm size and productivity. Moreover, the largest exporters contribute a substantial share to the inflation pass-through across markets, and they are the primary focus of my study[6]. Furthermore, I assign each product code to the industry NACE code from which it originated. This allows me to link the product with the destinations' industry and study the potential effect of the parameters of the productivity distribution on exporters' prices. If a product is associated with multiple NACE codes, I exclude it from analyses related to the productivity variables. Finally, I keep only the product codes related to the manufacturing sectors.

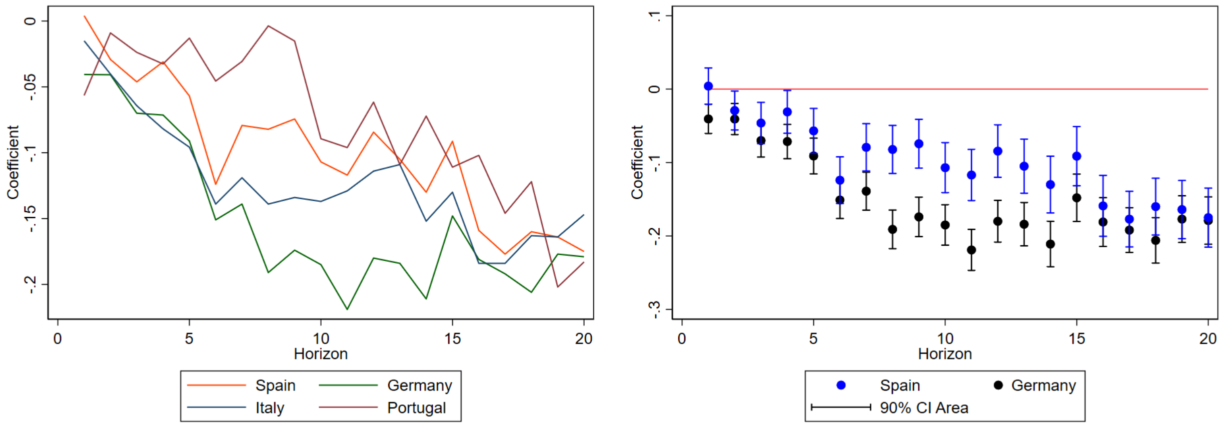
2.5 Results

Without including the productivity variables, local projections show consistent and significant differences across countries, as displayed in Figure 1. The price decrease is more substantial in the core countries than in the periphery, except in Belgium. However, Belgium is unique due to its stronger market connections with France (distance, common language, etc.). Additionally, exports to Belgium may include extra-EU exports via the port of Antwerp.

Examining the local projections that include a size dummy, I observe that larger firms, which are the main exporters, have a stronger and more consistent effect across countries. In many

[6]More specifically, on average, the firms with the highest categorical value account for more than 55% of the total exports to each country

comparisons, the differences between countries are statistically significant. One such case is between Spain and Germany. For the period of 7-13 months after the shock, the price change of French exporters to Germany is almost the change in prices to Spain. The differences are even more significant when comparing Portugal and Germany.



(A.) All countries

(B.) Spain-Germany

Figure 1: Cumulative price change rate to each destination country.

Notes: The figure displays the coefficient for the interaction between Country and MP shock for the largest exporters. I exclude the interactions with productivity or concentration.

These results provide evidence of dynamic price discrimination after a monetary policy shock. The fact that the cumulative price change rate converges 16 months after a monetary policy shock suggests that its short- and medium-term effects are consistent with the impact of monetary policy.

Furthermore, when I divide the countries in the "Core" and "Periphery" groups, I find significantly different price movements six months after a monetary policy shock, as shown in Figure 2). Another result is the relatively quick reaction of prices following a monetary policy shock. For instance, the prices of the main exporters from France to Germany and Spain change significantly two months after the monetary policy shock.

Effect of Concentration

By incorporative the productivity distribution variables (from Amadeus) into the local projections, I find that they are significant for the analysis. Specifically, as shown in Figure 4, the interaction of the shape parameter with the monetary policy shock is positively significant. Therefore, less concentrated destinations (industries) experience a milder decrease in export prices from France. Conversely, the interaction of the scale parameter with monetary policy shock is negatively significant. Hence, the higher the minimum TFP value, the lower the effect of the monetary policy

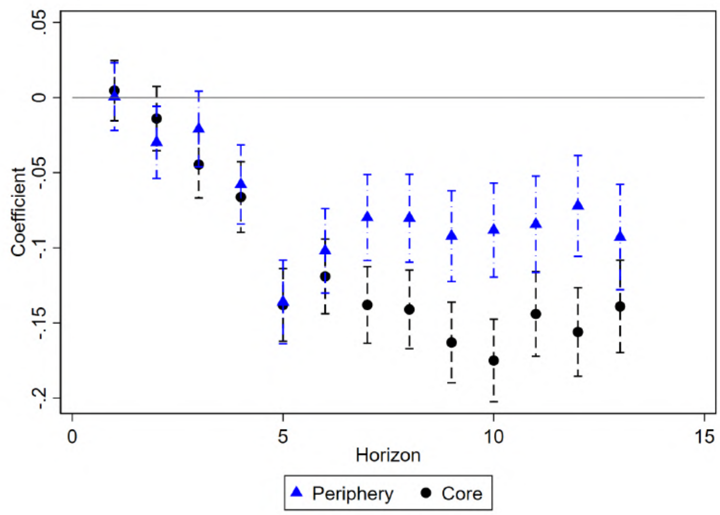


Figure 2: Cumulative percentage change rate to Core-Periphery.

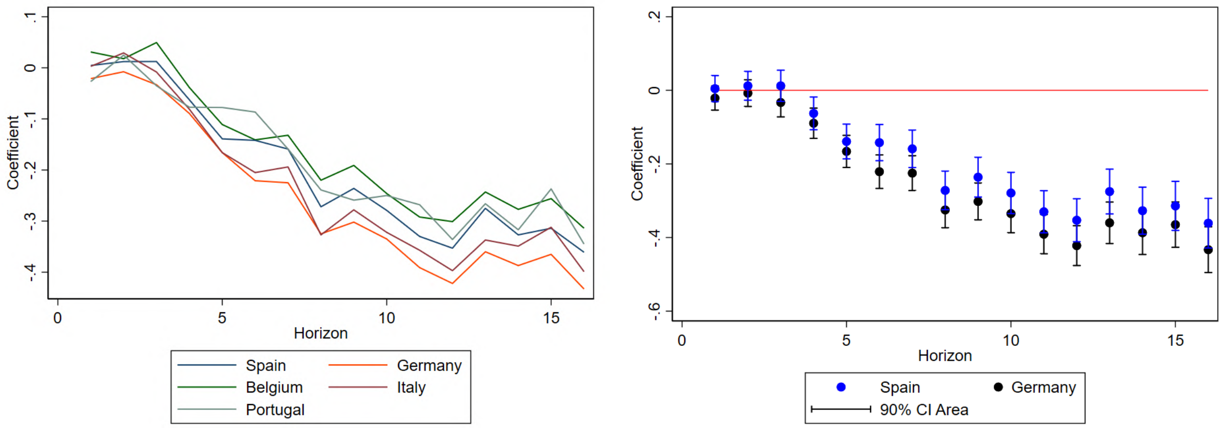
Notes: The figure displays the coefficient for the interaction between Core/Periphery and MP shock for the largest exporters. I exclude the destination firms distribution specific interactions. The core countries are Belgium, Germany, Netherlands and Austria while the periphery ones are Italy, Spain and Portugal

shock on export prices. Both scale and shape parameters are always included together in the local projections.

Local projections show a strong relationship between the shape parameter and the effect of a monetary policy shock. In the case of a 10 basis point monetary policy shock, if the value of the destination's shape parameter is higher by one, the export inflation by French exporters is approximately 0.75 percentage points higher – a strong and persistent effect. Conversely, the impact associated with the scale parameter is minimal, given the variation in the parameter's values across countries and sectors.

Furthermore, in most cases, Figure 3 shows that the differences between the country dummies become non-significant. The differences in productivity distributions may partly explain different movements across countries. For instance, the differences between Germany and Spain become less evident, but the coefficients are higher.

The results remain consistent when repeating the analysis using the shape and scale parameters from CompNet (see Appendix B for details). However, in this case, the differences between the core and periphery remain. One reason for this result can be the differences in the estimation of the TFP in CompNet and the missing observations for some countries and industries. Furthermore, the TFP skewness has a negatively significant coefficient, which is consistent since it is negatively associated with the shape parameter.

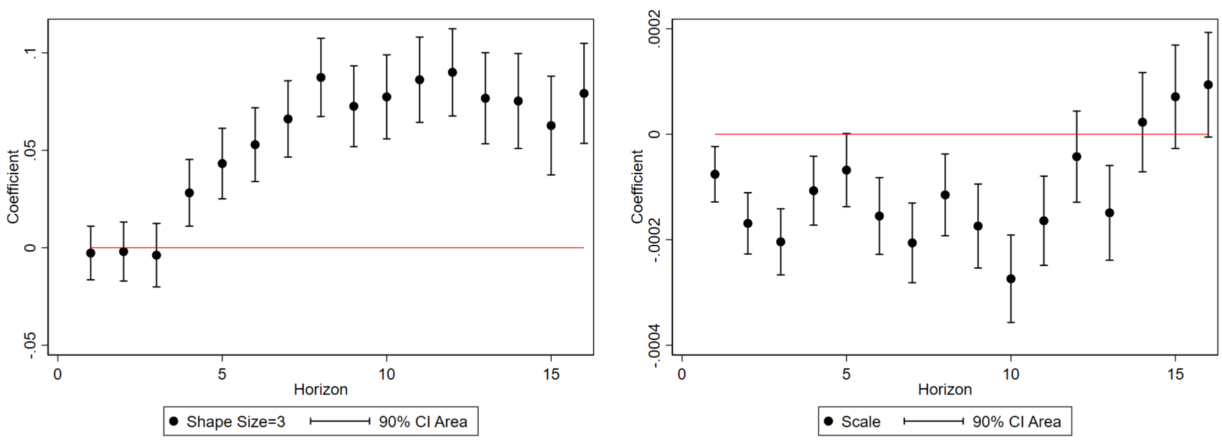


(A.) All countries

(B.) Spain-Germany

Figure 3: Cumulative percentage price change to each destination country.

Notes: The figure displays the coefficient for the interaction between Country and MP shock for the largest exporters. The destination firms distribution specific (Amadeus) interactions are included.



(A.) TFP Shape (Amadeus)

(B.) TFP Scale (Amadeus)

Figure 4: Role of the Shape and Scale of the productivity distribution

Notes: The figure displays the coefficient for the interaction between TFP Shape/Scale from Amadeus and MP shock for the largest exporters. The destination firms distribution specific interactions are included.

More specifically, the effect associated with the shape parameter (from CompNet) is very similar to those observed in the Amadeus results, showing an increase of 0.8 percentage points in response to a 10 basis point shock when the shape parameter differs by one. Conversely, an increase in skewness by one is associated with approximately 2 percentage points lower import inflation in the case of a 10 basis point monetary policy shock. However, the mean value in this scenario has a higher coefficient, as indicated by the summary statistics. For a 10 basis point shock, a one-unit

Variable	Setup 1	Setup 2	Setup 3	Setup 4
Shape (Amadeus)	0.9 p.p			
Scale (Amadeus)	-0.00274 p.p			
Shape (CompNet)		1.09 p.p		
Scale (CompNet)		0.374 p.p		
Skewness (CompNet)			-2.31 p.p	
Mean (CompNet)			0.88 p.p	
HHI revenue based				-8.42 p.p

Table 1: Peak responses related to the concentration/productivity.

Notes: The table displays the peak values of the coefficients related to the interaction of the firms distribution variables and monetary policy shocks for the biggest French exporters after a 10 basis points monetary policy shock.

increase in the mean TFP is associated with a 0.7 percentage point increase in import inflation.

Moving away from the productivity distributions, I also focus on the concentration in the destination market using the country-sector-specific Herfindahl–Hirschman Index (HHI). The results remain consistent when repeating the analysis with only the Herfindahl–Hirschman Index (HHI). The country-industries with higher concentration exhibit greater movements in the export prices from France.

To allow more flexibility in the frequencies and exploit more observations, I repeat the analysis at 3-month frequencies. Therefore, for each month, I use the mean price during the 3-month window for each transaction. This approach includes more firm-to-firm transactions in the local projections and reduces missing observations. However, it may lead to an over-representation of some observations. The monetary policy shocks are summed over 3-month periods. I include both pure monetary policy and information shocks because they can be correlated at lower frequencies.

The results remain consistent with the monthly frequency analysis. The concentration and productivity distribution variables remain significant, and their signs are the same. Another result is that the information channel leads to the opposite effect of the pure monetary policy shock. This is consistent with the literature. Detailed tables are shown in Appendix C.

Aggregate trade unit values

By moving to the aggregate data, I can shift the focus from the French customs data and identify patterns of dynamic price discrimination across all countries. In this way, I show that dynamic price discrimination leads to movements in the aggregate trade unit values and confirm the patterns using data from more countries.

I use yearly data from CEPII (Berthou and Emlinger, 2011) on the aggregate trade unit values[7] of 5,000 products at the reporter-partner country level. As before, I identify the NACE sector where each product is produced and use the country-sector-specific variables related to concentration and productivity. I use the bilateral flows among only the chosen Euro area countries (Belgium, Germany, Spain, France, Italy, the Netherlands, Austria, and Portugal)[8].

Given that the data are in yearly frequencies, I use the sum or mean of the yearly monetary policy shocks and study the change of the trade unit values of each bilateral trade relationship and product one year after the monetary policy shock.

The specification I use is similar to the one related to the customs data:

$$\frac{UV_{p,r,cs,t+1} - UV_{p,oc,ds,t-1}}{UV_{p,oc,ds,t-1}} = FE + \epsilon_t^M + \beta_h Conc_{ds,t-2}\epsilon_t^m + \sum_{l=1}^{4} y_{p,r,cs,t-l} + u_{p,cs,t+h}$$

The dependent variable is the cumulative change of the trade unit value for the product p, from the origin country sector (reporter) r to the destination country sector ds one year after the monetary policy shock. I include fixed effects related to the country origin, country destination, and product. Moreover, I include four lags of the cumulative change of the trade unit before the shock.

The main coefficient of interest is β_h, which is related to the role of the destination country sector's concentration or shape of the productivity distribution. As before, I use alternative specifications by including also country-shock interactions or industry-shock interactions. Moreover, I proceed with robustness checks by dropping product codes that have too much variation in their unit values – indicating that the specific product codes are not so homogeneous – or by avoiding the cleaning. More details can be found in Appendix D.

The first finding is that the cross-country patterns observed in the French transactions data are evident even in the aggregate data: the aggregate trade unit value towards the "core" (Germany, France, Belgium) decreases more one year after a yearly contractionary monetary policy shock (see Table 2)[9]. Secondly, by controlling for the concentration or the productivity distribution, I find a significant role of these factors in explaining cross-country and cross-industry differences in how the trade unit values move across the intra-Euro bilateral trade relationships (see Table 3). More specifically, higher HHI in the destination can lead to a great decrease in the unit value

[7]The trade unit values are FOB and I focus on the exports of each country.

[8]In the absence of sector-specific data on the distribution of firms in Austria, I use only the exports from Austria to the rest of the countries.

[9]One difference is that the Netherlands has the same movement as the "periphery". One explanation is the large petroleum exports from the Netherlands to other Euro area countries. Indeed, if we exclude the exports from the Netherlands, it follows the same pattern as the other core countries.

	UV change
MP shock	-1.498***
	(0.0220)
Inf shock	-1.921***
	(0.0241)
Periphery# MP shock	0.0960***
	(0.0357)
Periphery# Inf shock	0.185***
	(0.0378)
Constant	0.148***
	(0.00121)
Observations	967,761
R-squared	0.046

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 2: Cumulative Unit Value Change

Notes: The table displays the values of the coefficients related to the interaction of the Periphery and monetary policy shocks for the intra-Euro area bilateral trade flows. The specification includes three lags of the dependent variable.

after a contractionary monetary policy shock. On the other hand, higher Pareto shape values are associated with a smaller decrease in the unit value[10]. Therefore, the patterns observed in the transactions data are likely to have aggregate implications and are evident across all the intra-Euro bilateral trade relationships.

This empirical evidence strengthens the findings from the French customs data. The dynamic price discrimination observed by the French exporters may lead to the aggregate movements of the export prices of the products and a general producer price inflation pass-through. Moreover, in the absence of other reliable firm-to-firm customs data, this suggests that what is observed is likely a general pattern in the bilateral trade flows in the Euro area.

Heterogeneous Selection Effect

The results from the customs data provide signs of heterogeneous responses across country industries based on their firms' distribution. The question is, what dynamics could lead to this destination-specific effect? The concentration and distribution of firms' productivity play an essential role in monetary policy transmission. In this section, I identify the impact of monetary policy shocks on country sectors' productivity based on their characteristics.

[10]The Pareto shape variable is associated with the inverse of the skewness of the distribution and is negatively related to the HHI.

	UV change								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
HHI Rev#MP Shock	-3.472***	-4.211***	-2.879***						
	(0.520)	(0.568)	(0.617)						
HHI Rev#Inf Shock	0.562	-1.425***	0.315						
	(0.428)	(0.469)	(0.493)						
MP Shock	-0.605***			-1.739***			-1.319***		
	(0.0263)			(0.0732)			(0.0867)		
Inf Shock	-1.133***			-1.874***			-1.610***		
	(0.0267)			(0.0773)			(0.0948)		
TFP Shape (Amadeus)#MP Shock				0.112***	0.131***	0.0524*			
				(0.0238)	(0.0253)	(0.0314)			
TFP Min (Amadeus)#MP Shock				0.00039***	0.00044***	0.00011			
				(0.000136)	(0.000138)	(0.000652)			
TFP Shape (Amadeus)#Inf Shock				0.0656***	0.0809***	0.0608*			
				(0.0249)	(0.0267)	(0.0331)			
TFP Min (Amadeus)#Inf Shock				-0.00018	-0.00013	-0.00005			
				(0.000146)	(0.000147)	(0.000670)			
TFP Shape (Compnet)#MP Shock							0.396***	0.158**	0.317***
							(0.0461)	(0.0622)	(0.0527)
TFP Min (Compnet)#MP Shock							-0.122***	-0.0441**	-0.153***
							(0.0119)	(0.0204)	(0.0132)
TFP Shape (Compnet)#Inf Shock							0.242***	0.120*	0.326***
							(0.0503)	(0.0687)	(0.0570)
TFP Min (Compnet)#Inf Shock							-0.0968***	-0.0708***	-0.107***
							(0.0127)	(0.0214)	(0.0140)
Observations	477,888	477,888	477,888	475,614	475,614	475,614	332,551	332,551	332,551
R-squared	0.042	0.045	0.043	0.049	0.049	0.050	0.051	0.053	0.053
Country Interactions	No	Yes	No	No	Yes	No	No	Yes	No
Industry Interactions	No	No	Yes	No	No	Yes	No	No	Yes

Table 3: Cumulative Unit Value Change

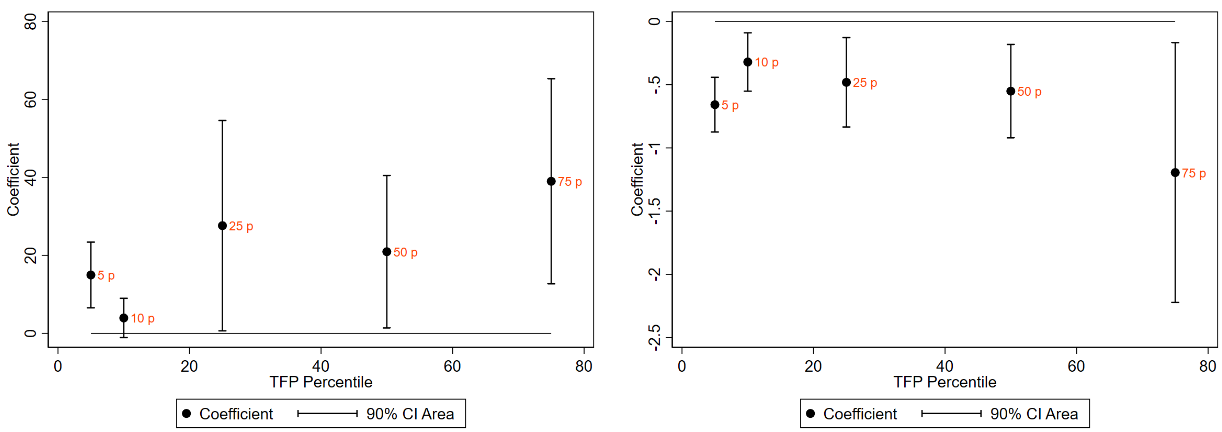
Notes: The table displays the values of the coefficients related to the interaction of the destinations' firms distribution variables and monetary policy shocks. I drop the product codes where at least 15% of the observations are related to extreme changes.

TFP levels themselves change after a monetary policy shock. A contractionary monetary policy shock can lead to changes in the value of some of the percentiles across the distribution. However, the characteristics of the firms' distribution may lead to heterogeneous marginal effects of monetary policy. For this reason, I interact firms' distribution variables with the monetary policy shock. The main interest is in the shape of the productivity distribution and the market concentration. The specification I use is the following:

$$TFP_{p,cs,t+1} - TFP_{p,cs,t-1} = FE + \epsilon_t^M + \beta_h Conc_{cs,t-2}\epsilon_t^m + \sum_{l=1}^{L} X_{t-l} + u_{p,cs,t+h}$$

The dependent variable is the change of TFP of the specific percentile of the TFP distribution one year after the shock, given that the TFP data are at annual frequencies, I use the annual sum of the monetary policy and information shocks for this analysis. I include both of them since, although they are uncorrelated at monthly frequencies, they are negatively correlated at lower frequencies, as their addition is equal to the total movement of the OIS rate during the announcements. Not including them may lead to biased results, as they would be omitted variables. Moreover, given that the number of observations is low relative to the number of time periods, I use the Driscoll and Kraay standard errors.

The effect is significant across most percentiles. More specifically, Figure 5 shows that in response to a cumulative 10 basis point monetary policy shock, TFP is expected to decrease (or increase less) by about 2% to 6% in the lowest 5th percentile for an extra unit of TFP shape, while a one standard deviation increase in HHI increases (or decreases less) the TPF by around 4%. In the other percentiles, the change in levels is very similar, but in percentage terms, it is lower. For example, in the 50th percentile, the percentage change is -0.9% for an extra unit of TFP shape and around 1.8% for one standard deviation increase in HHI. However, consistent with what we would expect from a Pareto distribution, the changes in levels are similar across the percentiles. Therefore, the selection effect seems to be strongly heterogeneous depending on the concentration and shape of the productivity distribution.



(A.) HHI Revenue

(B.) TFP shape (Amadeus)

Figure 5: TFP change

Notes: The figures display the coefficient for the interaction between HHI index or TFP Shape from Amadeus and MP shock for the various percentiles of the TFP distribution.

The results are robust even when using country or industry interactions with the monetary policy shock. Especially when the industry interactions are included, the heterogeneous effect seems much stronger, showing that the effects are more pronounced across countries and within industries. Therefore, even when we control for cross-country or cross-industry differences, there is significant heterogeneity in the reallocation of firms given the shape of the firms' productivity distribution.

The last result is consistent with the discussion about comparing the Pareto distribution and the Log-normal one (see Appendix B for details). The lower density observed on the left side of the distribution for the higher skewed distributions is consistent with the Pareto distribution. More specifically, a symmetric exit of unproductive firms leads to a higher increase in the TFP for the highly-skewed Pareto distribution. The Pareto distribution satisfies the first-order stochastic dominance observed in the cumulative productivity distribution in the Euro area countries. More details can be found in Appendix E.

The above results provide evidence of a heterogeneous selection mechanism after a monetary policy shock. The more skewed distribution has a low density in the lower tail, which can lead to an increase in the cut-off productivity after a contractionary shock, as shown in Figure 6. The productive surviving firms and foreign exporters would need to compete for a reduced demand in a very competitive market, leading to heterogeneous pressures on prices and markups.

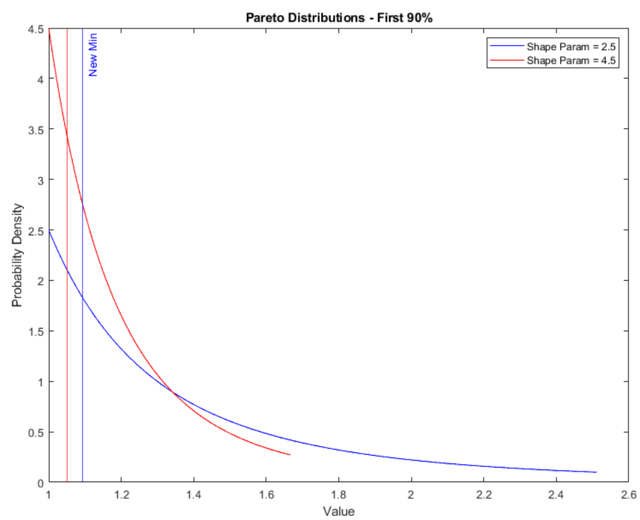


Figure 6: Heterogeneous Selection Mechanism

Notes: The figure displays how the heterogeneous selection mechanism leads to temporarily higher productive firms in the more skewed distribution.

3 Theoretical Model

The model integrates the New New Trade theory and New Keynesian theory within a two-country monetary union. It introduces a dynamic price discrimination initiated by monetary policy shocks. The distribution of firms and their interaction with the selection mechanism play a fundamental role in the heterogeneous responses of markups and prices. More specifically, a monetary policy shock will trigger the selection mechanism, leading to heterogeneous effects across the two countries. The heterogeneous changes in competition and productivity lead to heterogeneous movements of each domestic elasticity of demand and thus markups.

The two countries are identical except for the distribution of firms. More specifically, the Foreign (F) country has a higher share of productive firms than the Home country (H). This difference in the "shape" of the firms' productivity distribution can lead to a heterogeneous selection mechanism and, as a result, to hetergeneous movements of the elasticity of demand in each market.

Figure 7 illustrates the primary mechanism of the model. A common monetary policy shock reduces the demand for both domestic and foreign varieties by households in each country. This, in turn, activates a selection mechanism that generates heterogeneous changes in competitiveness, driven by the differences in firm distributions. Ultimately, these variations in competitiveness affect the elasticity of demand differently, resulting in distinct markup adjustments for firms operating across both markets.

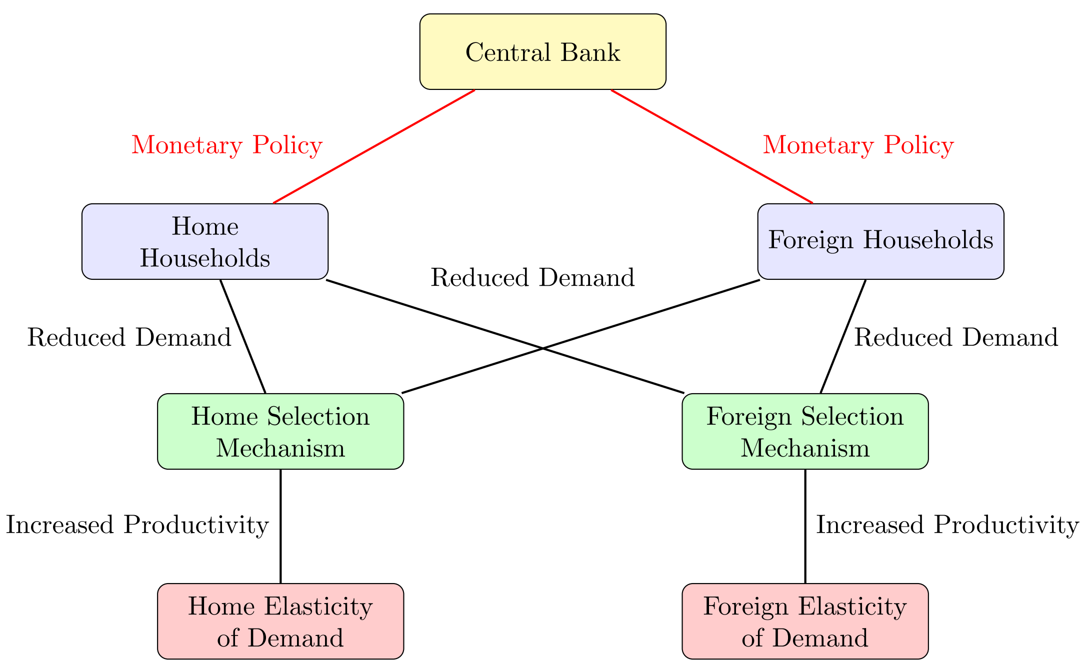


Figure 7: Main mechanism of the model for a contractionary monetary policy shock.

Incomplete markets

As discussed throughout this paper, I focus on the movements of export prices and output of final goods in a two-country model. Under complete markets, the literature has shown that after supply-side shocks, there is a unitary correlation between the real exchange rate and the ratio of home to foreign consumption which is contradicted by the data (see Backus and Smith (1993); Corsetti et al. (2008)). One explanation is that there is no perfect risk-sharing across countries. Ferrari and Picco (2023) find that the adoption of the common currency in the Euro area even decreased risk-sharing and consumption smoothing especially for periphery countries.

This model deviates from the classic CES preferences, and the selection mechanism can lead to supply-side effects of monetary policy shocks. Therefore, incomplete markets seem more suitable for matching the empirical findings.

Households

Following Ottaviano (2011), households have preferences over a continuum of differentiated varieties indexed by $i \in \Omega$. The representative household has the following utility function:

$$U = \alpha \int_{i\in\Omega} c_i^c di - \frac{1}{2}\gamma \int_{i\in\Omega} (c_i^c)^2 di - \frac{1}{2}\eta\Big(\int_{i\in\Omega} c_i^c di\Big)^2 - \frac{N_t^{1+\phi}}{1+\phi} \tag{2}$$

This function measures the utility that each consumer gains from each c_i^c, the individual consumption level of each variety i. The parameters α, η, and γ integrate the substitution and product differentiation patterns. More specifically, α and η represent the substitution between differentiated varieties, while a lower γ implies that consumers care less about varieties and more about increasing the quantity they consume in total. Moreover, $C^c = \int_{i\in\Omega} c_i^c di$ is the individual's total consumption of all the varieties. The parameter ϕ is the inverse Frish labor supply elasticity (Frisch, 1932).

I assume that a unique bond, which pays in units of Home aggregate consumption, is exchanged between the two countries with a net supply equal to zero. Households receive income from providing differentiated labor $N_t W_t$, the proceeds from holding the bond B_t, and the profits of all firms that operate, received as lump sum transfers $\int_{i\in\Omega} \Gamma_t(i)$. On the other hand, household expenditures are composed of the expenditures for final goods and the purchase of international bonds at a price G_t.

$$\int_{i\in\Omega} p_{i,t} c_{i,t}^c di + G_t B_t \leq \int_0^1 N_{e,t} W_{e,t} + B_{t-1} + \int_{i\in\Omega} \Gamma_t(i) \tag{3}$$

The household's problem is summarized as choosing the set $\{c_i^c, N_{e,t}, B_t\}$ taking as given

$\{p_{i,t}, W_t, G_t\}$ for every $t \in \{0, +\infty\}$ and $i \in \Omega$. Setting up the Lagrangian with $\lambda_{H,t}$ as Lagrange multiplier:

$$E_t \sum_{t=0}^{\infty} \beta^t U(c_{i,t}, N_{e,t}) - \beta^t \lambda_{H,t} \Big[\int_{i \in \Omega} p_{i,t} c_{i,t}^c di + c_t B_t - N_{e,t} W_t - B_{t-1} - \int_{i \in \Omega} \Gamma_t(i) \Big] \tag{4}$$

After solving the first-order conditions (see Appendix F.1 for details) and assuming that all households are identical and there is no heterogeneity, total consumption is equal to $c_{i,t} = Lc_{i,t}^c$, where $c_{i,t}^c$ is each household's consumption of variety i. Moreover, c_i should be positive to be consumed. Therefore, I take a subset $\Omega* \subseteq \Omega$ containing all varieties i consumed and let O denote the number of them. By integrating both sides of the equation of marginal utility of consumption:

$$aO_{H,t} - (\gamma + \eta O_{H,t}) C_{H,t}^c = \lambda_{H,t} \int_{i \in \Omega*} p_{i,t} di = \lambda_{H,t} O_{H,t} \bar{P}_{H,t} \tag{5}$$

$$C_{H,t} = \frac{(aLO_{H,t} - \lambda_{H,t} LO_{H,t} \bar{P}_{H,t})}{(\gamma + \eta O_{H,t})} \tag{6}$$

$$\lambda_{H,t} W_t^{Flexible} = N_t^{\phi} \tag{7}$$

Where $C_{H,t}^c$ is the total consumption units by each household, while $C_{H,t}$ is the total consumption in each market with $C_{H,t} = LC_{H,t}^c$. I assume for the rest of the model that $L_H = L_F = 1$. Therefore, the total consumption of all varieties depends positively on the number of varieties in the market during period t and negatively on the marginal utility of total consumption. As for labor, the equation 7 holds only for the steady state since I introduce wage rigidities in the following sections. Moreover, the value of flexible wages is optimal and uniform across all types of labor.

The number of varieties in the market affects the marginal gains from consumption. Furthermore, instead of a price index, there is the average price of the available varieties. The $\lambda_{H,t}$ is defined as the marginal utility of income in the domestic market and can differ from that in the foreign market.

However, $C_{H,t}$ includes consumption units of both domestic and foreign goods. Therefore, total Home consumption is equal to the consumption units of domestic and foreign varieties:

$$C_{H,t} = C_{H,t}^H + C_{H,t}^F \tag{8}$$

Where $C_{H,t}^H$ is the consumption units of domestic goods by the domestic market, and $C_{H,t}^F$ is the consumption units of foreign goods by the domestic market. The analysis of consumption expenditures is done in the next sections.

Similarly, the total number of varieties in the domestic market is equal to the domestic firms plus the foreign exporters:

$$O_{H,t} = O_{H,t}^{H} + O_{H,t}^{F}$$

Where $O_{H,t}$ is the total number of firms that sell in the domestic market H, $O_{H,t}^{H}$ is the number of firms that produce and sell domestically in market H, and $O_{H,t}^{F}$ is the number of exporters from market F to market H.

By using the demand function, there is a maximum price $pmax_t$ at which a firm can sell its product, as no purchases will occur at higher prices. Detailed derivations can be found in Appendix F.3. Finally, with this utility function, the price elasticity of demand is not stable, unlike with CES preferences. More specifically:

$$|\epsilon_i| = \left|\frac{dc_i}{dp_i}\frac{p_i^H}{c_i^H}\right| = \Big(\frac{pmax_{H,t}}{p_{i,t}} - 1\Big)^{-1} = \Big(\frac{pmax_{H,t}}{pmax_{H,t} - \frac{\gamma}{\lambda_{H,t}L}c_{H,i,t}} - 1\Big)^{-1} \tag{9}$$

The elasticity of demand depends on the expression $\left(\frac{pmax_t}{p_{i,t}} - 1\right)^{-1}$. Specifically, the elasticity of demand is an increasing function of the marginal utility of income $\lambda_{H,t}$ and a decreasing function of the product differentiation γ. Moreover, Equation 68 shows that the maximum price is a decreasing function of the marginal utility of income $\lambda_{H,t}$ and the number of varieties O_t, as well as of the average price of the varieties $\bar{P}_t$. Overall, an increase in $\lambda_{H,t}$ or the number of varieties O_t or a decrease in the average price of the varieties $\bar{P}_t$ leads to a rise in the elasticity of demand. The rise in the elasticity of demand makes the market more competitive leading to a decrease in the markups.

Furthermore, since the nominal interest rate should be equal to the gross yield of the risk-less bond:

$$\beta E_t(1 + i_t)\lambda_{t+1} = \lambda_t \tag{10}$$

The model, in contrast with the standard New Keynesian literature, will be solved non-linearly and in nominal terms.

In this model, the consumption-saving decisions of households are governed by the following equation:

$$\frac{(\gamma + \eta O_{H,t})C_{H,t} - aLO_{H,t}}{(\gamma + \eta O_{H,t+1})C_{H,t+1} - aLO_{H,t+1}} = \beta(1 + i_t)E_t\frac{\bar{P}_{H,t}}{\bar{P}_{H,t+1}}\frac{O_{H,t}}{O_{H,t+1}} \tag{11}$$

This equation includes an additional element compared to the standard version: the ratio $\frac{O_{H,t}}{O_{H,t+1}}$

which represents the change in the number of varieties available. Households prefer to spread their consumption across different goods, so an increase in the number of varieties can boost their marginal utility, while a decrease can reduce it. This element reflects how shifts in market dynamics, such as the entry and exit of firms, impact consumption choices and marginal utility by altering the range of available products.

Firms

As for the firms, I closely follow the model of Melitz and Ottaviano (2008). However, I include two additional layers of firms: the intermediate input firms and the raw material firms. Final goods firms use the intermediate input to produce the final good. Therefore, I deviate in two ways from the original model. First, final goods firms do not use inelastic labor but input from another layer of firms. Second, there is also trade of raw materials across countries. To summarise the structure:

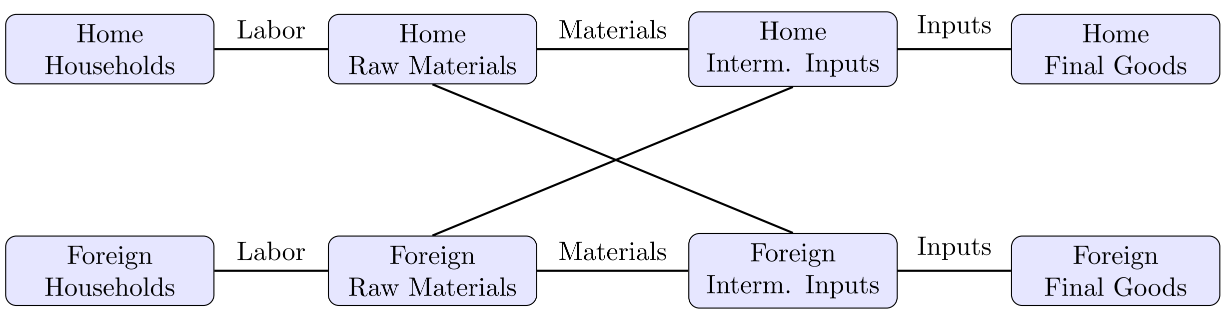


Figure 8: Production structure

Households provide labor to raw material firms, which produce using only labor (capital can be added), and a CES aggregator packages them. What they produce is used by intermediate input firms in each market. Raw materials from the Home and Foreign markets are considered imperfect substitutes. Then, intermediate inputs are used by final goods firms to produce the final product that consumers consume. The introduction of additional layers allows the model to be highly tractable while enabling further extensions, such as the introduction of capital.

Final Goods

Each final goods firm produces a differentiated good and seeks to maximize its profits. As in Melitz (2003), there is an entry fee cost to enter the market, representing the starting costs of production, research, development, and other fixed costs. Moreover, there are constant returns to scale with a marginal cost $MC_{i,t}$. Therefore, the firm's problem is summarized as follows:

$$max_{q_{i,t}} \pi_t = p_{i,t}(q_{i,t})q_{i,t} - MC_{i,t}q_{i,t} \tag{12}$$

Since there is only one factor, the intermediate input, and using the production function $q_{i,t} = A_i Y^I_{i,t}$, the marginal cost is $MC_{i,t} = \frac{P^I_{H,t}}{A_i}$ independently from the level of production. By denoting $v_i = \frac{1}{A_i}$, the marginal cost is equal to $P^I_{H,t} v_i$, where $P^I_{H,t}$ is the price of the intermediate input, and v_i is the inverse productivity of the firm.

By solving the maximization problem, the optimal conditions are:

$$\frac{dp_{i,t}}{dq_{i,t}} q_{i,t} + p_{i,t} = P^I_{H,t} v_i \tag{13}$$

Given the constant returns to scale and the stable marginal cost, the maximization problem in each market does not affect the other.

From the inverse demand function from the households section in Appendix F.3, there is a relation between the price and quantity of production of each variety i. Therefore Equation 13 becomes:

$$c_{i,t} = q_{i,t} = \frac{\lambda_{H,t} L}{\gamma} (p_{i,t} - P^I_{H,t} v_i) \tag{14}$$

By deriving the maximum cost a firm can have and produce by solving for $q_{i,t} = 0$ and substituting the maximum price $pmax_t$ that a firm can set as before. This provides a direct relationship between the maximum price and the cut-off cost – if a firm has a cost above this level, it does not produce. I denote this cut-off cost as $v^H_{H,t}$ and is equal with:

$$P^I_{H,t} v^H_{H,t} = pmax_{H,t} \rightarrow v^H_{H,t} = \frac{pmax_{H,t}}{P^I_{H,t}} \tag{15}$$

Proposition 3.1. *Heterogeneous changes in the cut-off cost directly result in heterogeneous changes in the elasticity of demand.*

Proof. By using Equation 14 and Equation 15 the elasticity of demand becomes:

$$|\epsilon_i| = \left(\frac{v^H_{H,t} + v_{H,i,t}}{v^H_{H,t} - v_{H,i,t}}\right) \tag{16}$$

Where $v_{H,i,t}$ is the cost of production by an individual firm that sells in the Home market.

Therefore, a higher decrease of $v^H_{H,t}$ leads to a higher elasticity of demand and thus to lower markups (given that $v^H_{i,t} < v^H_{H,t}$). The detailed proof can be found in Appendix F.7.

□

This aspect of the model bridges the empirical findings on the selection mechanism with the observed price discrimination practiced by French exporters. An heterogeneous movement in the cut-off productivity can lead to heterogeneous movements in the elasticity of demand.

The price equation is derived by substituting the inverse demand function in Appendix F.3 with Equation 15 to reach:

$$pmax_t - p_{i,t} = p_{i,t} - P^I_{H,t}v_{i,t} \iff p_{i,t} = \frac{1}{2}(pmax_t + P^I_{H,t}2v_{i,t}) \tag{17}$$

In the end, the equations for the price $p_{i,t}$ and markups μ_t of each variety i in the domestic market H are:

$$p_{i,t} = \frac{P^I_{H,t}}{2}(v^H_{H,t} + v_{i,t}) \tag{18}$$

$$\mu_t = \frac{P^I_{H,t}}{2}(v^H_{H,t} - v^H_{i,t}) \tag{19}$$

Hence, the most productive firms (and lower v_i) will have lower product prices and higher markups. Moreover, they will have higher profits and revenues than the firms with lower productivity. A decrease in $v^H_{H,t}$ would lead to reductions in individual prices, revenues, profits, and mark-ups.

When comparing to a model with common productivity across all firms and CES preferences, here the markups depend on the productivity of each firm. They are not stable, and the higher the productivity (lower the $v_{i,t}$), the higher the markup. The markup is equal to 0 only if $v_{i,t} = v^H_{H,t}$. Furthermore, the cut-off cost can affect each firm's markup, output, price, and profits. If $v^H_{H,t}$ decreases, a firm with stable productivity will decrease its price. A larger decrease in $v^H_{H,t}$ can account for the differences I observe in the empirical part.

Exporters from the Home market to the Foreign market face an "iceberg" cost [11] on their production equal to τ. Given the production function, the maximization problem can be solved separately for each market. The equations change to:

$$p^H_{i,F,t} = \frac{\tau P^I_{H,t}}{2}(\frac{P^I_{F,t}v^F_{F,t}}{\tau P^I_{H,t}} + v^H_{i,t}) \tag{20}$$

$$\mu^H_{i,F,t} = \frac{\tau P^I_{H,t}}{2}(\frac{P^I_{F,t}v^F_{F,t}}{P^I_{H,t}} - \tau v^H_{i,t}) \tag{21}$$

$$q^H_{i,F,t} = \frac{\tau \lambda_{F,t} P^I_{H,t}}{2\gamma}(\frac{P^I_{F,t}v^F_{F,t}}{\tau P^I_{H,t}} - v^H_{i,t}) \tag{22}$$

Where, $v^H_{F,t} = \frac{P^I_{F,t}v^F_{F,t}}{\tau P^I_{H,t}}$ is the cut-off inverse productivity that a domestic firm needs to have to export to the foreign market. This relationship contains the ratio of input prices in the two markets since it can affect the overall marginal cost of production. The model allows each firm to set different prices for each destination since the competition captured by $v^H_{F,t}$ and $v^H_{H,t}$ leads to different pressures on

[11] This is related to transportation costs, advertisement, etc.

markups, output, and prices.

The existence of a sufficiently high τ ensures that only a proportion of firms export to the foreign market. Otherwise, all firms from the more productive markets would export, contradicting empirical evidence from the literature. More specifically, it holds that $v^H_{F,t} < v^H_{H,t}$.

Productivity Distribution

To simplify the results, I assume that the distribution $G(v)$ for the productivity of the firms is a Pareto distribution with lower productivity bound equal to $A^d_t = \frac{1}{v_{i,t}}$ and shape parameter $1 \leq k$. Del Gatto et al. (2006), using firm-level data, find that the Pareto distribution fits well for firm productivity, with a k near 2. The shape parameter k indicates the degree of productivity heterogeneity across firms. The higher k is, the less dispersed and more concentrated the distribution is among lower-productivity firms. With $k = 1$, the distribution is the most dispersed. Additionally, any truncation of a Pareto distribution retains the same distribution. Therefore, the distribution is:

$$G(v) = \left(\frac{v}{v^M}\right)^{\kappa}, v \in (0, v^M] \tag{23}$$

In my framework, I study the dynamics between two countries with different distributions. The parameters κ and v^M are fundamental to identifying the differences in concentration and productivity across the economies. The markets are identical except for these two parameters. The goal is to replicate the dynamics observed in the empirical part.

if we assume that the foreign country is more productive, with zero tariffs, it would lead all the Foreign firms to export to the domestic market. The iceberg cost τ would eliminate this possibility and allow exporters' bilateral entry and exit. More specifically, based on the cumulative density function, the share of exporters from each market is:

$$O^F_{H,t} = (\frac{v^F_{H,t}}{v^F_{F,t}})^{\kappa_F} O^F_{F,t} \tag{24}$$

$$O^H_{F,t} = (\frac{v^H_{F,t}}{v^H_{H,t}})^{\kappa} O^H_{H,t} \tag{25}$$

In this way, a sufficiently high τ ensures that $v^H_{F,t} < v^H_{H,t}$ and $v^F_{H,t} < v^F_{F,t}$. The cut-off productivity of exporting to each market is higher than the cut-off productivity of entering the domestic market. Moreover, the share of firms that export from the home market to the foreign market can change with different cut-off costs, but it also depends on the shape parameter of each distribution.

Output, Consumption and Price Index

The average price of products is influenced by the domestic price of intermediate inputs, the cut-off cost of domestic firms, and the shape parameters of both countries, weighted by the number of varieties sold in the domestic market. The equation is:

$$\bar{P}_{H,t} = \frac{O^H_{H,t}\frac{2\kappa+1}{2(\kappa+1)}P^I_{H,t}v^H_{H,t} + O^F_{H,t}\frac{2\kappa_F+1}{2(\kappa_F+1)}P^I_{H,t}(v^H_{H,t})}{O_{H,t}} \tag{26}$$

Where $O^H_{H,t}$ is the number of Home firms that sell in the home market while $O^H_{F,t}$ is the number of Home firms that sell in the foreign market.

Similarly, the average production of each product in the domestic market is determined by both the domestic and foreign prices of intermediate inputs, the domestic cut-off cost, and the ratios of domestic to foreign varieties. The presence of the Lagrangian multipliers, $\lambda_{H,t}$ and $\lambda_{F,t}$, multiplied by the price of intermediate inputs, links the production function to the marginal income gain in each market, thereby affecting overall demand [12]. This establishes a form of pricing parity among firms in each market, with minor variations due to the differing distributions of firms. Conversely, the production levels of firms in each country respond more significantly to shifts in demand and the competitiveness of both markets.

$$\bar{Q}^H_t = \frac{Q^H_t}{O^H_{H,t}} = \frac{O^H_{H,t}\frac{\lambda_{H,t}}{2\gamma(\kappa_H+1)}P^I_{H,t}v^H_{H,t} + O^H_{F,t}\frac{\lambda_{F,t}}{2\gamma(\kappa_H+1)}P^I_{F,t}v^F_{F,t})}{O_{H,t}} \tag{27}$$

Regarding markups, all firms with the same productivity (domestic or foreign) have the same markup due to pricing parity. However, the average markup differs between domestic and foreign firms because of the different productivity distributions:

$$\bar{\mu}^H_t = \frac{\mu_{H,t}}{O_{H,t}} = \frac{O^H_{H,t}\frac{P^I_{H,t}v^H_{H,t}}{2(\kappa_H+1)} + O^F_{H,t}\frac{P^I_{H,t}v^H_{H,t}}{2(\kappa_F+1)}}{O_{H,t}} \tag{28}$$

To understand inflation and its movements, it is essential to determine each economy's price index by appropriately weighting the consumption of each good. The production of the final good in each economy can be represented as the sum of domestic consumption and exports:

$$Q^H = Q^H_{H,t} + Q^H_{F,T} = O^H_{H,t}\frac{L}{2\gamma(\kappa_H+1)}\lambda_{H,t}P^I_{H,t}v^H_{H,t} + O^H_{F,t}\frac{L}{2\gamma(\kappa_H+1)}\lambda_{F,t}P^I_{F,t}(v^F_{F,t}) \tag{29}$$

The consumption units of the final goods in each economy is equal to the sum of domestic con-

[12]The wage rigidities allow the monetary policy to affect the real marginal income gain and λP^I

sumption of domestically produced goods and imports from foreign markets:

$$C_{H,t} = Q^H_{H,t} + Q^F_{H,T} = Q_{H,t} = O^H_{H,t}\frac{\lambda_{H,t}}{2\gamma(\kappa_H+1)}P^I_{H,t}v^H_{H,t} + \frac{\lambda_{H,t}}{2\gamma(\kappa_F+1)}O^F_{H,t}P^I_{H,t}v^H_{H,t} \tag{30}$$

The price index is calculated as the expenditure-weighted average price of all goods consumed:

$$P^H_t = \frac{O^H_{H,t}\frac{\lambda_{H,t}P^I_{H,t}v^H_{H,t}{}^2}{4\gamma(\kappa_H+2)} + O^F_{H,t}\frac{\lambda_{H,t}P^I_{H,t}v^H_{H,t}{}^2}{4\gamma(\kappa_F+2)}}{C_{H,t}} \tag{31}$$

Free Entry Equilibrium

Following Melitz (2003), I assume that a firm only learns its productivity after paying an irreversible entry cost, as first modeled by Hopenhayn (1992). This fixed cost is measured in units of an intermediate input, so a firm will choose to enter only if expected profits exceed this cost. Moreover, the price of the investment good is determined by the price of the intermediate input. The final relationship is:

$$\pi^H_t = \int_0^{v^H_{H,t}} \pi^H_{H,i,t}dG(v^H) + \int_0^{v^H_{F,t}} \pi^H_{F,i,t}dG(v^H) - P^I_t f_E \tag{32}$$

Where $\pi^H_{H,I,t}$ are the profits from the domestic sales while $\pi^H_{F,i,t}$ are the profits from the foreign sales. A new firm will enter the market only if the expected profits are non-negative, i.e., $\pi^e_t = 0$. The distribution should consider all the firms that may enter, not only the surviving ones. Consequently, the maximum inverse productivity shifts from $v^H_{H,t}$ to v^M_H representing the minimum productivity a firm can potentially have if no fixed costs were present. Additionally, I assume that firms are required to pay the fixed cost each period while their profits are distributed to households without accumulation. This assumption ensures a distinct distribution for each market in each period.

Solving for the condition $\pi^H_t = 0$ (see Appendix F for details), the cut-off cost in the economy for each period is given by:

$$v^H_{H,t} = \big(f_E\frac{2\gamma(\kappa_H+1)(\kappa_H+2)(v^M_H)^{\kappa_H}}{\lambda_{H,t}L_H P^I_{H,t}} - \tau^2\frac{\lambda_{F,t}L_F}{\lambda_{H,t}L_H}(\frac{(P^I_{F,t})}{\tau(P^I_{H,t})}v^F_{F,t})^{\kappa_H+2}\big)^{\frac{1}{\kappa_H+2}} \tag{33}$$

It is also necessary to assume that v^M_H is sufficiently greater than $v^H_{H,t}$. This is because the less productive firms will incur losses and choose not to participate in production. Since these firms do not survive, they will not be included in our set Ω^*.

The cut-off cost of the Home country directly depends on the cut-off cost of the foreign country. Moreover, it depends on the price of intermediate inputs and the marginal utility of consumption in each country, establishing interdependence between the two economies and affecting production costs in each market. Moreover, I assume that $L^F = L^H$; however, if the foreign market size is relatively small, the impact on the domestic economy is minimal.

The presence of the ratio $\frac{(P^W_{F,t})}{\tau(P^W_{H,t})}$ accounts for differences in the productivity of final goods firms, incorporating the price of intermediate inputs. Lower productivity in the foreign market increases the selection effect in the domestic market. Specifically, higher foreign inverse productivity $v^F_{F,t}$ results in lower domestic inverse productivity $v^H_{H,t}$.

Notably, the term $\lambda_{H,t}P^W_t$ indirectly connects the cut-off productivity to the marginal utility of households. A contractionary monetary policy shock would lead to a higher value of this term, consequently decreasing in the cut-off productivity.

Proposition 3.2. *In equilibrium:*

$$\hat{v}^H_H \approx \underbrace{-\frac{A_H}{\kappa_H+2}\left(\hat{\lambda}_{H,t}+\hat{P}^I_{H,t}\right)}_{\textit{Domestic Effect}} - B_H \underbrace{\left[(\hat{P}^I_{F,t}-\hat{P}^I_{H,t})+\hat{v}^F_{F,t}+\frac{1}{\kappa_H+2}\left(\hat{\lambda}_{F,t}-\hat{\lambda}_{H,t}\right)\right]}_{\textit{Foreign Effect}} \tag{34}$$

Where:

$$A_H = \frac{f_E \frac{2\gamma(\kappa_H+1)(\kappa_H+2)(v^M_H)^{\kappa_H}}{\lambda^*_H P^*_H}}{v^{H*}_H} \qquad B_H = \frac{\tau^2 \frac{\lambda^*_F}{\lambda^*_H}\left(\frac{P^{I*}_F}{\tau P^{I*}_H}\right)^{\kappa_H+2}}{v^{H*}_H}$$

Proof. The result is derived by log-linearizing Equation 33. □

Proposition 3.2 differentiates between the domestic and foreign effects within the selection mechanism. The **domestic effect** hinges on changes in the marginal gain from income and the prices of intermediate inputs, as well as the value of the shape parameter. In contrast, the **foreign effect** is associated with changes in the profit generated from exports by domestic firms. This incorporates the relative shifts in the price of intermediate inputs and the marginal gain from income, along with the productivity of the foreign market (which is tied to competitiveness) and the shape parameter. Notably, the direct impact of the foreign market's cut-off cost exerts a negative effect on the domestic market's cut-off cost—a more productive foreign market reduces domestic firms' export profits, which, in turn, has a positive effect on the domestic market's cut-off cost. The following two Lemmas explain the variations observed based on the value of the shape parameter.

Lemma 3.3. *In a closed economy, the domestic effect becomes stronger when the distribution of firms is more skewed, which corresponds to a lower value of the shape parameter k.*

Proof. In a closed economy the equation is transformed to :

$$\hat{v}_H^H \approx -\frac{1}{\kappa_H + 2}\left(\hat{\lambda}_{H,t} + \hat{P}_{H,t}^I\right) \tag{35}$$

Given that the two economies are identical except for their shape parameter, the economy with a more concentrated distribution (i.e., a lower κ) will exhibit a stronger selection effect. This occurs because a lower κ implies a higher concentration of firms with varying levels of productivity, intensifying the competitive pressure. Consequently, a contractionary monetary policy shock would result in a more significant decrease in the cut-off cost for the more concentrated economy, as firms face greater challenges to remain viable in the market.

□

Lemma 3.4. *In the two-country model, under the given calibration, the foreign effect carries greater weight compared to the domestic effect in the less concentrated economy.*

Proof. The proof directly follows from the steady state conditions of the two economies. The less concentrated (Home) country, characterized by a higher shape parameter k, exhibits a higher cut-off steady state (v_H^H) along with a lower nominal marginal gain of income and a lower price of intermediate inputs. As a result, $B_H > B_F$ and $A_H < A_F$. Consequently together with the lower domestic effect, this leads to a stronger reliance on the foreign effect.

□

Overall, these lemmas highlight the importance of the foreign effect on economic outcomes. Since the domestic effect is more pronounced in the foreign (more concentrated) economy for small changes in $\lambda_{H,t}, \lambda_{F,t}, P_{H,t}^I, P_{F,t}^I$, and given that the foreign effect has a greater impact on the home market, the resulting trade dynamics will amplify the differences in selection effects between the two countries. Specifically, in response to a contractionary monetary policy shock, the stronger domestic effect in the foreign economy leads to a more substantial decrease in the cut-off productivity in the foreign economy, while the home economy experiences a relatively smaller decline in its cut-off productivity.

Intermediate inputs

It is possible to derive the total demand for intermediate input from the final goods firms. The input used by each firm can be expressed as:

$$I_{i,t} = q_{i,t} * c_{i,t}$$

where $q_{i,t}$ is the quantity of final good produced and $c_{i,t}$ is the input per final good unit that firm i produces at time t.

By using the productivity distribution assumed in the previous sections, we can aggregate the demand across all firms to find the total intermediate input demand (details in Appendix F.7) from the final goods firms:

$$I^W_{H,t} = \frac{\kappa_H \lambda_{H,t} O^H_{H,t} P^I_{H,t} L_H}{2\gamma(\kappa_H+1)(\kappa_H+2)}(v^H_{H,t})^2 + \frac{\kappa_H \lambda_{F,t} O^H_{F,t} L_F}{2\gamma(\kappa_H+1)(\kappa_H+2)} \frac{(P^I_{F,t})^2}{\tau P^I_{H,t}}(v^F_{F,t})^2 + f_E O^H_{H,t} \tag{36}$$

The first component relates to the domestic demand for final goods, while the second part addresses the foreign demand. Additionally, firms need a fixed quantity of intermediate inputs each period to enter the market.

Intermediate input firms use raw materials to produce the inputs consumed by final goods firms. I assume that raw materials can be traded across countries, with an elasticity of substitution equal to $\frac{1}{1-\rho}$ with $\rho < 1$. This assumption implies that raw materials are imperfect substitutes, compelling wholesale goods firms to source raw materials from both economies to produce effectively:

$$I^W_{H,t} = (\alpha^{1-\rho} {M^H_{H,t}}^{\rho} + (1-\alpha)^{1-\rho} {M^F_{H,t}}^{\rho})^{\frac{1}{\rho}} \tag{37}$$

where M^H_H represents the raw materials produced in country H and used by country H.

The price of the intermediate input is equal to:

$$P^I_{H,t} = (\alpha {PM^F_{H,t}}^{\frac{\rho}{\rho-1}} + (1-\alpha) {PM^H_{H,t}}^{\frac{\rho}{\rho-1}})^{\frac{\rho-1}{\rho}} \tag{38}$$

Where $PM^F_{H,t}$ is the price of the raw materials produced in country F and sold in country H.

By introducing these two layers of firms, I am able to maintain the differences between the movements of $P^I_{H,t}$ and $P^I_{F,t}$ relatively small and interrelated. Specifically, both prices of raw materials are incorporated into the equation, weighted by α and the elasticity-related parameter ρ. This structure ensures that the interaction between domestic and foreign input prices remains balanced and interconnected within the model.

Raw Material Firms and Optimal Pricing

Assume a continuum of firms producing using labor, where all firms share the same productivity level A_t, consistent with the New Keynesian framework. This assumption implies that productivity is homogeneous across firms, allowing for simplified analysis of output, pricing, and employment dynamics.

$$M_{j,t} = A_t L_j N_{j,t}^{1-\alpha} \tag{39}$$

Since the firms are symmetric, at the steady state, the total production will be equal to:

$$M_t = A_t L (N_t)^{1-\alpha} \tag{40}$$

The use of raw materials by wholesale firms is structured by assuming the following CES "packaging" function:

$$M_t^H = (\int_0^1 (M_{j,t})^{\frac{\epsilon-1}{\epsilon}})^{\frac{\epsilon}{\epsilon-1}} \tag{41}$$

which by solving the problem of the firms (see Section **??** for details) would lead to the price:

$$PM^H = (\int_0^1 p_{j,t}^{1-\epsilon} dj)^{\frac{1}{1-\epsilon}} \tag{42}$$

I assume that the price of raw materials is uniform across both markets. However, there is an iceberg cost associated with the trade of raw materials. Therefore:

$$PM_F^H = PM_H^H * \tau \tag{43}$$

The total production of raw materials by each country is equal to:

$$M_t^H = M_{H,t}^H + M_{F,t}^H = A_t L N_t^{1-\alpha} \tag{44}$$

The raw material firms produce with a marginal cost equal to W_t, and they price their product: $P_t^I \frac{\epsilon-1}{\epsilon} W_t$ where ϵ is the price elasticity of demand from the intermediate input firms. In the baseline results, I consider wage rigidities, which did not impact firms' markups. In an extended analysis, quadratic costs of price adjustments can be introduced with an effect on the markup and marginal cost of production.

As will be demonstrated in the following sections, the trade elasticity of inputs plays a pivotal role in influencing both trade flows and markups.

Monetary Policy

I use a simple Taylor rule:

$$i_t = \frac{1}{\beta}(\frac{i_{t-1}}{\beta})^{\rho^i}(\Pi_t^{\phi_p}\frac{Q_t}{Q_{ss}}^{\phi_y})^{1-\rho^i}\xi_t \tag{45}$$

where $log(\xi_t)$ is following an AR(1) process with $0 < \alpha_\xi < 1$:

$$log(\xi_t) = \varepsilon_t \tag{46}$$

The Taylor rule incorporates both the deviation of final production from its steady state and inflation, which is calculated based on the price index of final goods. The movement of the cut-off cost contributes to changes in markups, which has a further effect on inflation. Specifically, if a contractionary shock results in a reduction of $v_{H,t}^H$ (and so an increase in productivity), it triggers a procyclical effect on prices during the shock period due to increased competition. However, in subsequent periods, the entrance of less productive firms leads to a countercyclical effect on prices as market conditions shift.

I assume that both markets have equal size and weight in the application of the Taylor rule. Consequently, the central bank considers the average inflation and the deviation from the overall steady-state output in its policy decisions.

Trade Balance

The trade balance between the two economies is influenced by several factors. First, the relative number of Home exporters compared to foreign exporters has a positive effect on the domestic trade balance. This relationship is moderated by two key dynamics: the number of domestic firms and the cut-off productivity level in each market. The economy with a more concentrated firm distribution has a higher density of firms with high productivity and is more responsive to changes in competition in the foreign market. Second, the pricing to market leads to different effects on the value of exports. For example, $P_{F,t}^W c_{F,t}^F$ represents the maximum value a firm can set on the foreign market, and it would lead to different exporting prices if there are differences across countries. Additionally, the Lagrangian multiplier is associated with the marginal utility of wage or consumption. In incomplete markets, the Lagrangian multiplier can move differently across countries. The trade balance of the final goods is equal to:

$$TG_{H,t} = O_{F,t}^H \frac{\lambda_{F,t}(P_{F,t}^I)^2 v_{F,t}^F}{4\gamma(\kappa_H + 2)} - O_{H,t}^F \frac{\lambda_{H,t}(P_{H,t}^I)^2 v_{H,t}^H}{4\gamma(\kappa_F + 2)} \tag{47}$$

The first part defines the exports from the home market to the foreign market while the second part defines the associated imports. While the overall trade balance is equal to:

$$T_{H,t} = O^H_{F,t}\frac{\lambda_{F,t}(P^I_{F,t})^2 v^F_{F,t}}{4\gamma(\kappa_H+2)} - O^F_{H,t}\frac{\lambda_{H,t}(P^I_{H,t})^2 v^H_{H,t}}{4\gamma(\kappa_F+2)} + M^H_{F,t}PM^H_t - M^F_{H,t}PM^F_t \tag{48}$$

The overall trade balance takes into account the trade of raw materials between the two countries.

Finally, the shape parameter κ leads to different prices than domestic ones. Specifically, imports are cheaper in the domestic market when $\kappa_F < \kappa_H$. This is because the foreign market, with a lower k, has a higher concentration of more productive firms, resulting in a greater density at the right tail of the productivity distribution. Consequently, the increased productivity among foreign firms enables them to offer competitive prices, making imports more affordable compared to domestically produced goods.

Debt elastic interest rate

As shown in Schmitt-Grohé and Uribe (2003), the model would not induce stationarity since, after a shock, the bond holdings will not return to a steady state. For this reason, I use a debt-elastic interest rate, which would lead to slight deviations of each domestic interest rate from the monetary union one. More specifically, the interest rate will be slightly higher if a country holds debt.

$$i^*_{H,t} = i_t + \psi(e^{(\frac{d_{H,t}}{\bar{d}_{H,t}})} - 1) \tag{49}$$

Where debt is equal to $d_{H,t} = -B_{H,t}$ and ψ is a parameter related to the interest rate premium. I assume a very low value of ψ that induces stationarity.

Wage rigidity

I introduce wage rigidity a la Calvo (1983). Each household provides a range of differentiated labor input $N_t = \int_0^1 N_{e,t}$ with a wage $W_{e,t}$. Each labor input has a probability μ to change its wage. Given that this probability is independent of the labor input:

$$log(W_t) - log(W_{t-1}) = \beta E_t(log(W_{t+1}) - log(W_t)) + \frac{\mu(1-\beta(1-\mu))}{1-\mu}(log(N^\phi_t) - log(W_t\lambda_t)) \tag{50}$$

The wage would depend on the previous wage level and the expectation of the wage level for the next period. In this way, I can introduce wage rigidities without leading to state-dependent changes in the markup of the intermediate input.

4 Results

Closed Economy

In this section, I present the responses generated for a closed economy model. By assuming two identical closed economies that differ only in their productivity distributions, the model yields different magnitudes of responses.

The shape and scale parameters are critical in determining the effects of a monetary policy shock. Notably, there is no trade of raw material goods within this closed economy framework. For this analysis, I use the following calibration:

Parameter	Description	Value
f_E	Fixed entry cost	0.17
v_H^M	Maximum potential cost	13.5
v_F^M	Maximum potential cost	13.5
ϕ	Inverse Frisch elasticity	3
η	Preferences parameter	10
α	Preferences parameter	5
γ	Preferences parameter	11
A	Productivity of the intermediate input firms	1
L	Market size	1
κ_H	Shape parameter of Pareto distribution	2.5
κ_F	Shape parameter of Pareto distribution	2
α_N	Capital returns	0
τ	Iceberg cost	1.5
ϕ_π	Taylor rule (Inflation)	2
ϕ_y	Taylor rule (Output)	0.2
ϵ	Elasticity	6
β	Discount factor	0.99
ρ_ξ	AR(1) monetary policy shock	0.9

Table 4: Parameters, their descriptions, and values

I use the elasticity of labor supply and substitution parameters related to raw materials as outlined in Gali and Monacelli (2005). The preference parameters are calibrated to enable trade within a monetary union between two economies, where the shape parameters are $\kappa_H = 2.5$ for the Home economy and $\kappa_F = 2$ for the Foreign economy. For higher values of α the less concentrated economy would only import final goods. Similarly, I use a sufficiently high τ. In the baseline model, I assume there is no capital and that raw material production exhibits constant returns to scale.

As previously described in the model, production assumes constant returns to scale, and the population is normalized to 1. Additionally, I use the price of raw materials $PM_t = 1$ as the numeraire. Following these assumptions, I derive the steady state of the system:

Variable	Description	$\kappa = 2.5$	$\kappa = 2$
Q_{ss}	Final Good Output	0.064	0.076
v_{ss}^d	Inverse Cut-Off Productivity	13.268	12.207
N_{ss}	Employment	0.649	0.661
I_{ss}	Intermediate input	0.649	0.661
O_{ss}	Number of Firms	1.124	1.198
P^W	Price of Intermediate Input	1	1
$P_{\max}$	Maximum Price	13.268	12.207
λ	Langrangian Multiplier	0.328	0.346
W_{ss}	Wage	0.833	0.833
$\bar{P}$	Average Price	11.373	10.173

Table 5: Comparison of Steady State Values for Different κ Values

The economy with a higher concentration of firms (lower k), and consequently more productive firms, exhibits higher levels of steady-state output, productivity (inverse of v_{ss}), firms, labor, and input. Additionally, this economy maintains a lower price level but a higher markup, as reflected in the equations. This outcome stems from the assumption that the input price is the same across the two economies.

To further analyze these dynamics, I run simulations of a monetary policy shock using the established equations, parameters, and steady-state values described above. These simulations help illustrate the differing responses between the two economies, highlighting how variations in productivity distribution shape economic outcomes under policy changes.

As expected, the markups follow the cut-off cost $c_{H,t}^H$ and decrease in response to a contractionary monetary policy shock. Additionally, the cut-off costs, output, real wages, inflation, the number of firms, and employment all decline as a result of the shock. The real interest rate rises as the nominal interest rate increases beyond its steady-state level due to an overreaction to inflation. The markup of the final good represents the additional effect on markups compared to the standard New Keynesian model. Therefore, my model can replicate empirical findings observed in the literature, such as the reduction in the number of firms following a contractionary policy shock. Moreover, the model incorporates endogenous productivity and markups, offering a richer analysis of economic dynamics and firm behavior after monetary policy shocks.

Different Distributions

Finally, I repeat the simulations, this time using different values for the productivity distribution. I choose the shape parameters $\kappa = 2.5$ and $\kappa = 2$ for the Pareto distribution while keeping the minimum potential productivity for firms fixed at $v^M = 13.5$. This setup allows for a comparison of results between economies with varying productivity distributions k but the same minimum productivity threshold v^M.

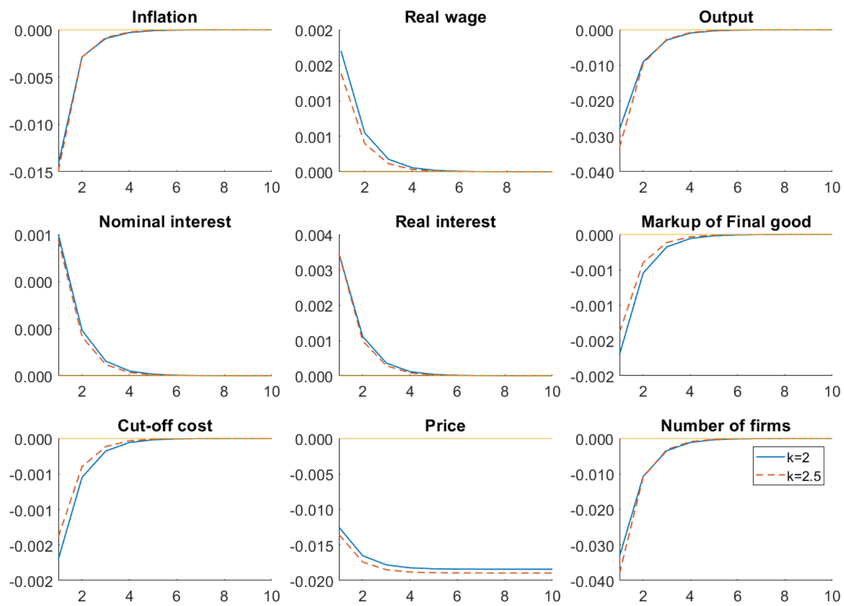


Figure 9: Responses for different Shape

Notes: The table presents the responses of a closed economy for a different shape parameter. All the values are log-deviations from the steady state. The monetary policy shock is 10 basis points.

I observe that the cut-off costs, and markups decrease more significantly in economies with more skewed productivity distributions while the output decreases less. In the more productive economy, productivity increases more, and markups fall more, leading to distinct movements in output and real wages. Additionally, the number of firms shows a slightly higher reduction in the less concentrated economy. All these results are related to the log-deviations from the steady state and not the changes in levels.

Furthermore, I repeat the procedure while keeping the shape parameter constant at $\kappa = 2$ for both distributions but using different values for the minimum productivity, v^M: $v^M = 13.5$ and $v^M = 11$. The results show that both economies react in a nearly identical manner, with the observed differences being very small and insignificant. The only notable distinctions are in output and the number of firms: output decreases to a lesser extent in the more productive economy, while the number of firms decreases more sharply. Consequently, the model suggests that the shape of the productivity distribution has a greater impact on outcomes than the scale (minimum value) and it is consistent with the baseline empirical results.

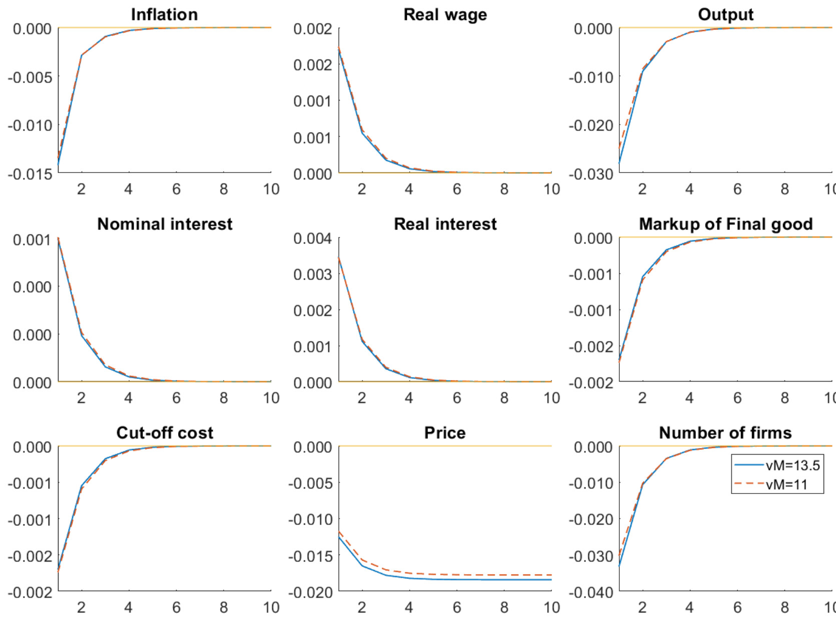


Figure 10: Responses for different Shape

Notes: The table presents the responses of a closed economy for a different scale parameter. All the values are log-deviations from the steady state. The monetary policy shock is 10 basis points.

Monetary Union

In transitioning to the two-country monetary union model, I assume two identical countries that differ only in their productivity distributions. These differences alone can result in varying magnitudes of the monetary policy effect across countries. I focus specifically on differences in the shape parameter, testing the case where $\kappa_H = 2.5$ and $\kappa_F = 2$, while assuming a trade elasticity for raw materials of 2.[13] The trade channel and the interdependencies can lead to a more important role for the differences in the productivity distribution of the firms.

The model simulation reveals significant heterogeneous effects between the two economies and an "amplification" effect in the less concentrated (less skewed) market. The selection mechanism drives unproductive firms out of both economies, resulting in increased productivity (lower cut-off costs). However, following a contractionary monetary policy shock, there is an asymmetric adjustment in the cut-off levels. According to the free-entry condition, the decline in demand causes a more minor cut-off movement in the less skewed economy. The productivity distribution in economies with higher κ has greater density among less productive firms, meaning the expected profits do not

[13]The results are robust even when assuming an elasticity of 1 or 6. However, with low elasticity, the consumption and quantity ratio significantly increases for the less skewed market after the initial periods.

change drastically. This limited reallocation leads to a more considerable output reduction, as the productivity of final goods firms does not adjust to the same extent as in economies with lower κ.

Variable	Description	$\kappa = 2.5$	$\kappa = 2$
Q_{ss}	Final Good Output	0.019	0.161
v^d_{ss}	Inverse Cut-Off Productivity	12.969	10.509
N_{ss}	Employment	0.591	0.662
C_{ss}	Consumption	0.079	0.101
I_{ss}	Intermediate input	0.178	1.049
O_{ss}	Number of Firms	1.288	1.685
P^W_{ss}	Price of Intermediate Input	1.308	1.370
P^M_{ss}	Price of Raw Materials	1	1.260
P_{ss}	Consumer Price Index	6.410	5.406
$P_{\max}$	Maximum Price	16.968	14.399
λ_{ss}	Langrangian Multiplier	0.247	0.276
W_{ss}	Wage	0.833	1.050
$\bar{P}_{ss}$	Average Price	14.231	12.013
$O^H_{H,ss}$	Domestic Firms	0.291	1.615
$O^H_{F,ss}$	Exporters	0.070	0.997
M_{ss}	Raw Materials	0.591	0.662
T_{ss}	Trade Balance (Final Goods)	-0.293	0.293

Table 6: Steady state of the two country model

The further decline in cut-off costs in more concentrated economies is consistent with the empirical evidence discussed earlier related to the selection mechanism . Moreover, this shift in cut-off costs allows the model to replicate the observed pricing dynamics of French exporters following a monetary policy shock. Since the elasticity of demand is endogenous and influenced by each market's cut-off cost, exporters adjust their prices and markups after the shock. The decrease in demand, reduction in product variety, and rising marginal consumption gain all contribute to lower markups due to increased competition from the surviving productive firms. However, firms must reduce prices even further in more concentrated markets, as competition is more intense. Figures 12 and 13 demonstrate that a 10-basis-point contractionary monetary policy shock leads to a 0.22% cut-off cost reduction in the less skewed market and a 0.34% reduction in the more skewed market.

Regarding inflation, the model shows an initial spike during the shock, causing a rise in the relative prices of final goods. In the less concentrated economy, the consumption basket becomes more expensive than in the more concentrated one. As unproductive firms re-enter the market in subsequent periods, the relative price ratio converges to its steady-state value. As a result, the inflation differential is high and positive in the first period but turns negative after that. Indeed, as Figures 11 and 13 illustrate, a 10-basis-point contractionary monetary policy shock causes prices to rise by approximately 0.1% more in the less concentrated economy compared to the more concentrated one. The value is not as small as it seems, given that this translates to around 12% lower inflation in the Foreign market.

There are also strong heterogeneous responses in final goods production. As shown in Figures 12 and 13, output declines significantly more in the less concentrated economy. Specifically, the output of final goods falls by 4% in the case of $\kappa = 2$, while the decline is around 8% in the less concentrated economy $\kappa = 2.5$. The primary driver of this disparity is the productivity gains in final goods firms. In contrast, movements in consumption units are similar between the two countries, though the difference is smaller. Both output and consumption unit changes are sensitive to the raw material elasticity across countries for intermediate input production. When elasticity is close to 1, the signs of the percentage changes in consumption and output tend to reverse more quickly after the shock.[14]

The model offers valuable insights into trade dynamics between the two countries. Overall, the trade balance of final goods improves for the less productive (less skewed $\kappa = 2.5$) economy, primarily due to a larger reduction in imports. As shown in Figures 12 and 13, the percentage decrease in exporters from the steady-state value is larger for the less skewed economy. The lower cut-off cost in the foreign economy makes it harder for domestic firms to enter that market. However, because there are more exporters from the more skewed economy in the steady state, the absolute decline in exporters is greater for the more skewed economy. This effect outweighs the increase in foreign exports to the home country. Overall, the home country's final goods trade balance increases due to the absolute change in the number of exporters between the two countries. In Figure 13, we see that after a 10-basis-point contractionary monetary policy shock, the final goods trade balance in the less skewed economy rises by about 0.9% in the first period. However, after an initial increase, the overall trade balance in the less skewed economy turns negative before returning to its steady state.Furthermore, the entry and exit of exporters across the two markets would contribute to stabilizing the average markup between the two countries. A lower number of foreign exporters, driven by reduced demand in the Home market, would result in further decreases in markups, ultimately bringing the average markup closer to parity across the two markets.

The model successfully replicates the dynamics observed in the empirical section. As seen in Figure 13, a firm with stable productivity (e.g., a French exporter or a third-country exporter) would increase by 0.25% more the markup in the less skewed economy than in the more skewed one. The subfigure illustrates the difference between $\frac{pmax_{H,t}-(pmax_H^S)}{pmax_H^S}$ and $\frac{pmax_{F,t}-(pmax_F^S)}{pmax_F^S}$, closely related to the shape parameter and monetary policy shock.[15] On the other hand, cut-off costs decreases less in the less concentrated economy. Indeed, in the empirical section, I provide evidence of a reallocation effect that leads to higher productivity in more concentrated economies.[16] With

[14] Even in the displayed graphs, the consumption and output percentage changes reverse due to bond movements and the debt-elastic interest rate.

[15] Note that the dependent variable is the cumulative price change.

[16] The paper's primary goal is not to match aggregate productivity movements but rather to highlight cross-country

the current calibration, the model generates coefficients of about 0.5% for markups and 0.24% for productivity, compared to 0.9% and 2% in the empirical data.[17] It is also important to note that the estimation uses a wide range of variables to account for country-specific effects, exporter size, and other factors. o

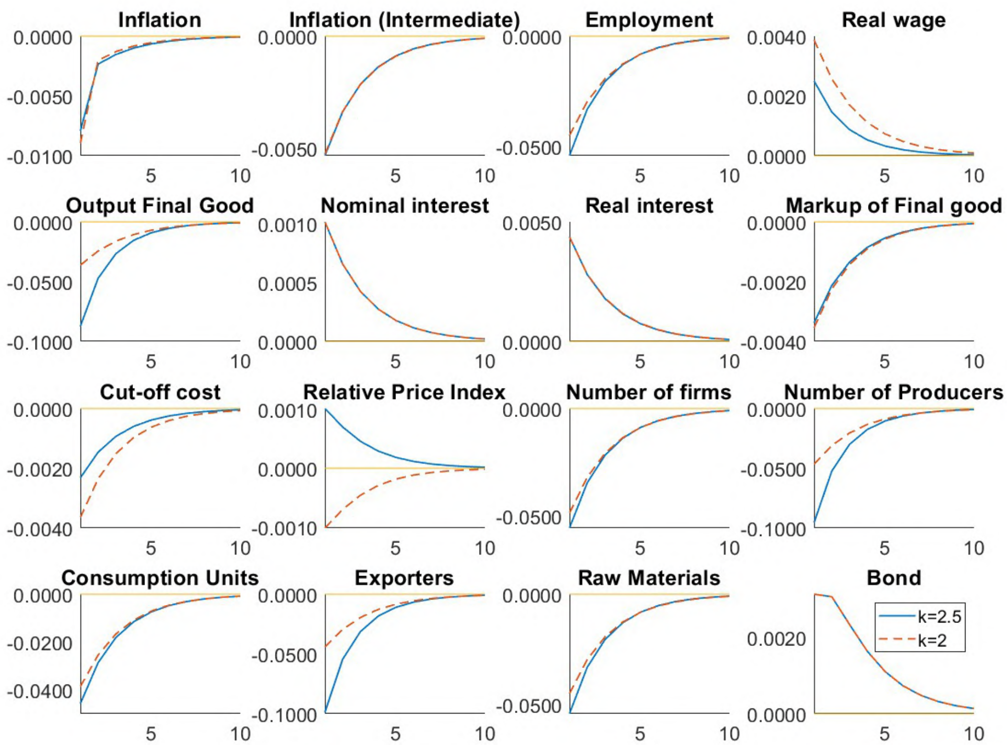


Figure 11: Response functions to a contractionary monetary policy shock

Notes: The figure displays responses on a ten basis point contractionary monetary policy shock. The trade elasticity is equal to 2. The values are the log-deviations from the steady state. The figure "Bond" displays the Bond holdings of the home households.

differences due to the selection effect.

[17] Productivity data uses yearly frequencies, making precise matching difficult. Moreover, the steady state of the cut-off cost can be important for the comparison between the empirical part and the model.

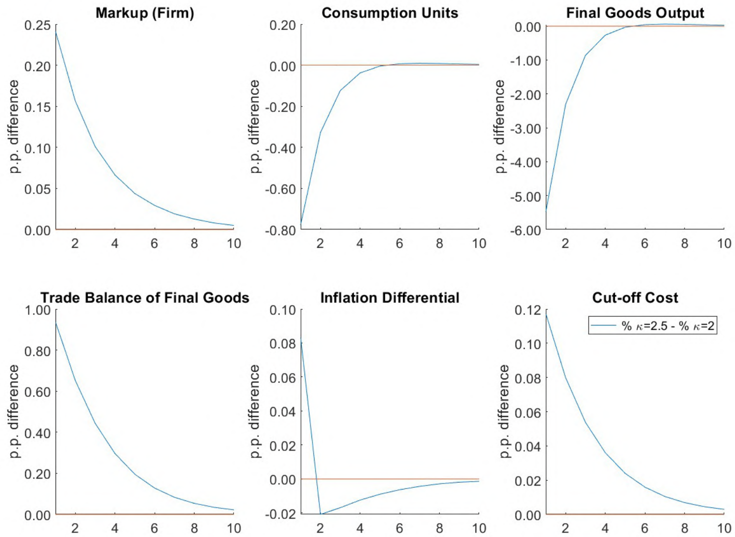


Figure 12: Response functions to a contractionary monetary policy shock

Notes: The figure displays responses on a ten basis point contractionary monetary policy shock. The trade elasticity is equal to 2. The deviations are in percentage change from the steady state. The Markup (Firm) subfigure shows how a third country exporter would change its markup in a different way across the two countries.

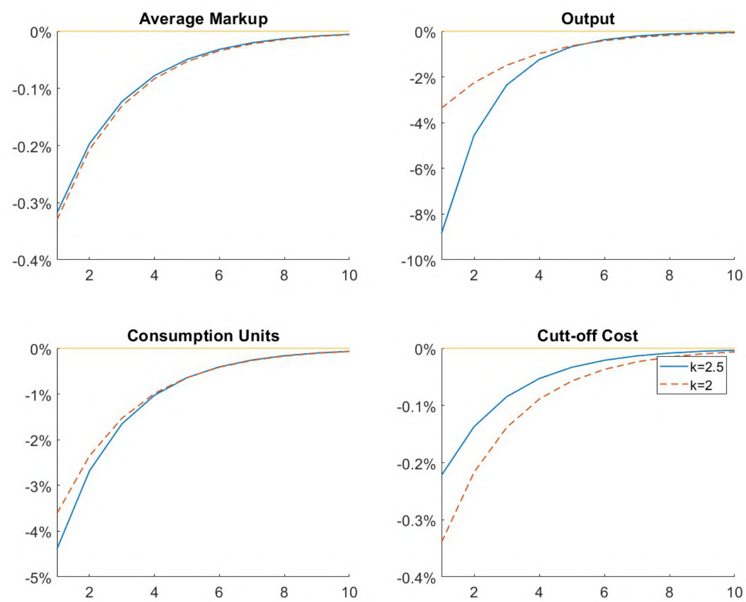


Figure 13: Response functions to a contractionary monetary policy shock

Notes: The figure displays responses on a ten basis point contractionary monetary policy shock. The trade elasticity is equal to 2. The values are the difference between the Home and Foreign percentage change from the steady state (except from the trade balance).

Small Open Economy

To understand the role of interdependencies between the two economies in the model, I simulate the small open economy framework. In this setup, trade between the economies is included, but the dynamic effects of monetary policy on the foreign economy are excluded. This approach reveals that disregarding the interactions between the two economies results in an inability to replicate empirical findings.

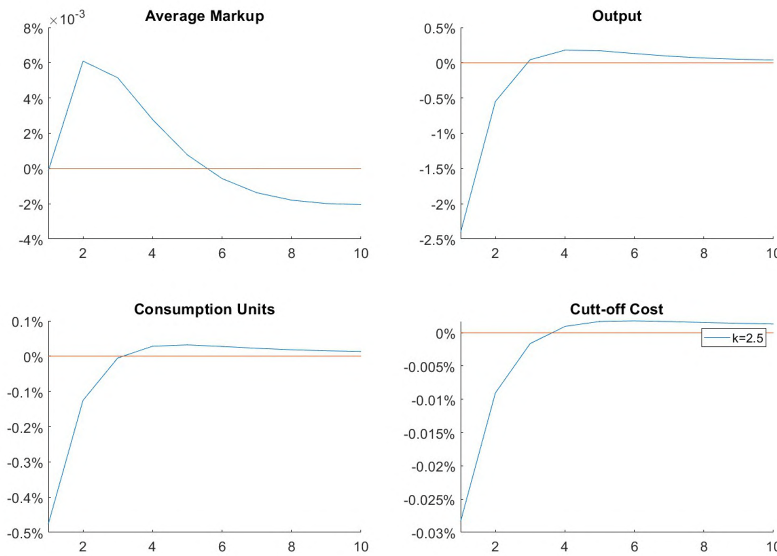


Figure 14: Responses to a contractionary monetary policy shock- small open economy

Notes: The figure displays responses on a ten basis point contractionary monetary policy shock. The trade elasticity is equal to 2. The values are the log deviations from the steady state).

Indeed, as shown in Figure 14, the response patterns differ significantly from those observed in the two-country model. Specifically, the decrease in the cut-off productivity level is much smaller, resulting in a weaker selection effect. This results in minimal differences between the two economies and only marginal markup adjustments by exporters. The average markup increases by less than 0.0007%, illustrating that a small open economy framework cannot capture the pronounced heterogeneous changes in the selection effect and markup adjustments seen in a more interconnected, two-country setup.

Output and Trade

Beyond dynamic price discrimination and productivity effects, the model predicts additional outcomes. Notably, output decreases significantly more in less concentrated economies, while net exports of final goods increase. Furthermore, the Producer Price Index (PPI) declines more in highly concentrated markets. Although these dynamics are theoretically interesting, there is a notable gap in the existing literature when it comes to empirical evidence supporting these outcomes. In this section, I address this gap by providing empirical evidence using local projections to show that the model's predictions align with observed data.

I employ country-sector-specific macroeconomic data at monthly frequencies, focusing on the manufacturing sectors within the Euro area. Additionally, I incorporate variables related to the distribution of firms. Further details on the data and specifications are provided in Appendix G.

$$y_{t+h} - y_{t-1} = \alpha_0 + \mathrm{FE} + \epsilon_t^M + \beta_h \mathrm{Prod}t - 12\epsilon^m t + \sum_{l=1}^{L} X_{t-l} + u_{t+h} \tag{51}$$

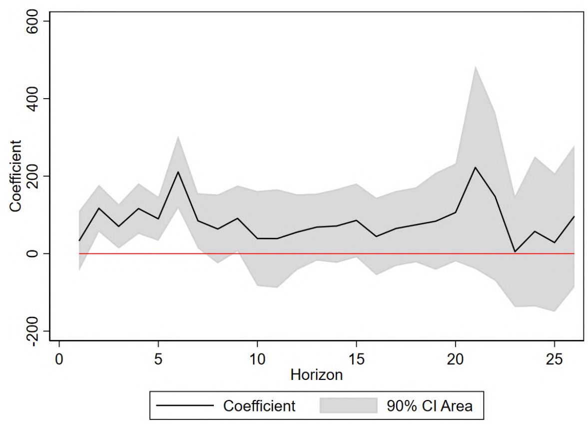
The dependent variable is the change in the industrial production or producer price index (log) or the intra-euro trade balances for each specific country-sector. I include lags of the dependent variables as explanatory variables. Additionally, country, industry, and month fixed effects are incorporated[18].

The results reveal consistent and significantly different responses of country-sectors to monetary policy shocks, contingent upon their market concentration. Specifically, in more concentrated country-sectors (one s.d. difference), industrial production decreases more by approximately 1.2% following a contractionary 10 basis point cumulative monetary policy shock. Additionally, there is a pronounced decline in trade balances. Furthermore, these more concentrated sectors (one s.d. difference) experience stronger decreases in their domestic Producer Price Index (PPI)[19] and in their import price index from other Euro area countries, with decreases more by around 0.2% for the same contractionary shock. These findings remain robust even when employing the scale and shape parameters from Amadeus and CompNet.

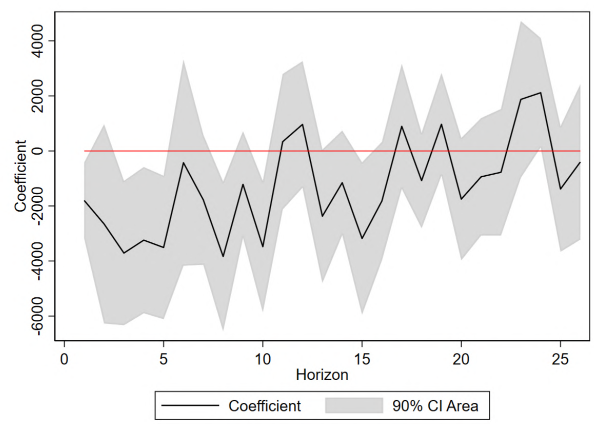
These empirical responses provide evidence that the additional predictions of the model align with observed data. Not only do the signs of all responses correspond with theoretical expectations, but the model also accounts for the stronger effects on output. The selection mechanism emerges as the primary driver of these results, while the existing pricing parity contributes to a smaller yet significant effect on prices.

[18] In the case of trade balances, I also include lags of their own values.

[19] The PPI of domestic firms in the domestic market.



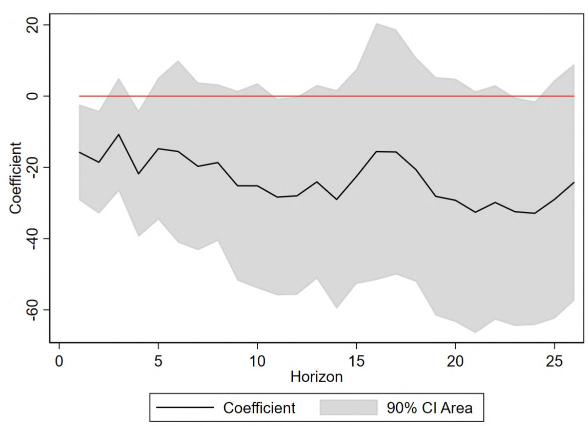
(A.) Industrial Production



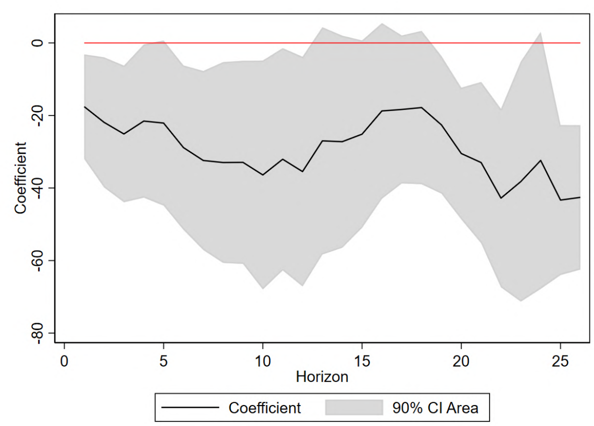
(B.) Trade Balance

Figure 15: Responses to Monetary Policy Shock

Notes: The figures display the coefficients for the interaction between concentration (HHI) and monetary policy (MP) shock. Industry interactions with the MP shock are included.



(A.) PPI (Domestic)



(B.) Import Price Index (Euro area)

Figure 16: Responses to Monetary Policy Shock

Notes: The figures display the coefficients for the interaction between concentration (HHI) and monetary policy (MP) shock. Industry interactions with the MP shock are included.

5 Conclusions

This paper investigates the heterogeneous transmission of monetary policy within a monetary union, emphasizing the critical role of market concentration and firms' productivity distributions. Using macroeconomic and customs data, I provide evidence of asymmetric responses in export prices across the Euro area, highlighting how variations in market structures contribute to these differences. By incorporating the trade model of Melitz and Ottaviano (2008) into a two-country monetary union framework, the paper replicates these empirical findings and shows that the selection mechanism embedded in the model reflects observed productivity dynamics following a monetary policy shock.

The model provides further insights into how contractionary monetary policy shocks affect trade balance and output, particularly in economies with more skewed productivity distributions. Empirical evidence from country- and sector-specific data supports these findings, demonstrating that economies with lower market concentration experience sharper declines. These results underscore the varied impacts of monetary policy due to structural differences across member countries, challenging the conventional view of uniform policy effectiveness within a monetary union.

Dynamic price discrimination emerges as a crucial factor in the monetary policy framework. Destination-specific market concentration influences inflation pass-through between countries, introducing new dynamics into the transmission of monetary policy. This highlights the limitations of a one-size-fits-all approach and calls for a broader discussion on optimum currency area theory and the potential role of supplementary fiscal policies. Variations in firms' productivity distributions can lead to divergent inflation and markup dynamics, directly affecting policy responses. Moreover, reducing entry barriers for firms may amplify these dynamics by increasing market concentration.

The empirical findings from French exports illustrate the importance of firm-level and transaction-level data in capturing economic dynamics within a large currency area. Extending this analysis to other countries' customs data would enhance our understanding of underlying mechanisms and reveal potential deviations or influencing factors. Beyond monetary unions, the concept of dynamic price discrimination may also be relevant in integrated markets with fixed exchange rates, even in the presence of exchange rate variability. This could have implications for large economies like the United States, where regional differences in firms' distributions may lead to heterogeneous effects on monetary policy transmission.

The model developed in this paper integrates Melitz and Ottaviano (2008) selection mechanism with endogenous and heterogeneous markups, wherein a producer's markup depends on its productivity and the concentration of the destination market. The inclusion of wage or price rigidities introduces real economic effects, as changes in demand impact market competition. Firms facing reduced demand adjust their markups, and less productive firms may exit the market. The degree of these effects is influenced by the distribution of firms' productivity, leading to varied responses to common monetary policy across different countries. The model's outputs align with observed empirical patterns related to trade, production, and pricing.

Future research could explore the design of optimal monetary policy within this context. Given that monetary policy shocks affect output and inflation heterogeneously across the Euro area, understanding the policy implications is vital. The strength of dynamic price discrimination hinges on trade intensity among member countries and disparities in firms' productivity distributions, which could lead to complex inflation pass-throughs within the currency union. Investigating the efficacy of unconventional monetary policies and the interaction between monetary and fiscal policies would provide valuable insights. Furthermore, this paper focuses mainly on the producer price index and not on how retailers set prices. Future research is needed on how retailers absorb these changes to determine the overall impact on consumer price index inflation.

This paper sheds light on how common monetary policy shocks influence trade dynamics in the Euro area. The adoption of a unified currency and market has heightened trade interdependence among member countries. Dynamic price discrimination and heterogeneous trade responses thus stand out as significant features of monetary union economics. Continued research and the collection of detailed data are necessary to deepen our understanding of trade dynamics, particularly in response to common economic shocks, and to evaluate the impact of various policy measures.

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Appendix A Descriptive Statistics

In this section, I provide the summary statistics for all datasets utilized in the empirical analysis of the customs data.

Variable	Obs	Mean	Std. dev.	Min	Max
Price Change	29,770,000	0.0298	0.274	-0.660	2

Table A1: Summary Statistics for the monthly change of prices

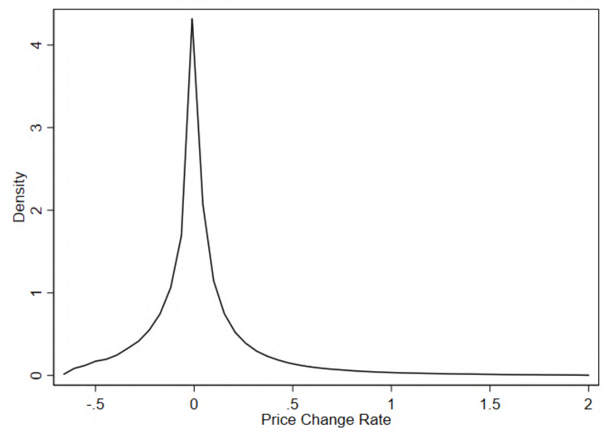


Figure A1: Density distribution of price change rate

Variable	Obs	Mean	Std. dev.	Min	Max
TFP Mean	998	5.822	4.476	1.759	36.82
TFP Skewness	998	1.196	0.621	-0.857	4.278
TFP Scale	998	2.283	1.156	0.765	10.63
TFP Shape	998	1.785	0.734	0.437	4.984

Table A2: Summary Statistics for the productivity parameters from Compnet

Variable	Obs	Mean	Std. dev.	Min	Max
HHI Revenue	1,712	0.0442	0.0600	0.000811	0.548
HHI VA	1,712	0.0410	0.0536	0.000652	0.423
HHI Revenue Mean	1,724	0.0460	0.0607	0.00133	0.437
HHI VA Mean	1,724	0.0422	0.0522	0.00112	0.311

Table A3: Summary Statistics for the concentration parameters from Compnet

Variable	Obs	Mean	Std. dev.	Min	Max
TFP Scale	115	78.26	122.5	0.0310	625.0
TFP Shape	115	2.422	1.213	0.218	11.66

Table A4: Data from Amadeus

Variable	Obs	Mean	Std. dev.	Min	Max
Monetary Policy Shock	214	0.0025713	0.0294721	-0.1714997	0.1645002

Table A5: Summary Statistics for the monthly monetary policy shocks

Percentiles	Shape	Scale
1%	0.2411368	0.0623969
5%	0.6691915	1.972184
10%	1.344294	4.111791
25%	1.855894	6.970936
50%	2.468457	22.88199
75%	2.863277	96.18256
90%	3.463891	191.765
95%	3.798515	359.9561
99%	4.775873	600.516

Table A6: Summary Statistics for Shape and Scale parameters from Amadeus

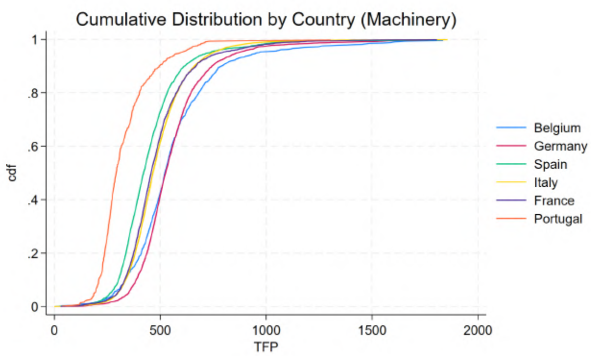
Appendix B Productivity Estimation

I use firm-level data from the Amadeus database. I chose firm-level data from selected Euro area countries from 2013 to 2019 and focused on the manufacturing industry. I consider capital the difference between total assets and fixed intangible assets, while I use sales as revenues. Firstly, I deflate the variables using specific price indices. I use the industry-level price index to deflate material costs and turnover, while for capital, I use a country-specific price index for gross fixed capital formation.

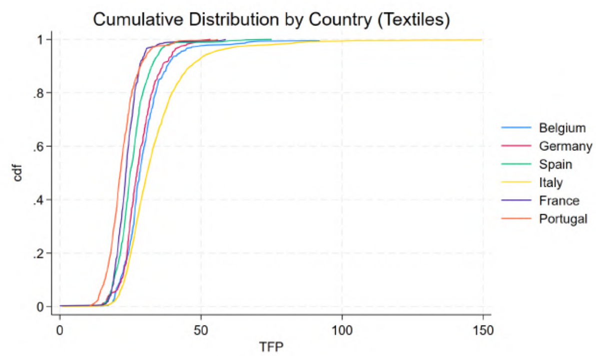
As for the procedure of estimating the productivity of the firms, I focus on the method from Ackerberg et al. (2015). They introduce a new method to condition out unobserved shocks connected with the production technology. Their work is based mainly on Olley and Pakes (1992) control for the correlation between inputs and the unobserved productivity process. An OLS or fixed effects estimation would lead to wrong estimations since the coefficients would be biased and inconsistent. The issue is a simultaneity problem. Firms that become more productive also increase their labor and other factors, and thus, there is a positive correlation between inputs and the error term, which would represent productivity. In Levinsohn and Petrin (2003), they use the Total Factor Productivity decomposition from Olley and Pakes (1992) who compare productivity allocation across firms in a specific year, but they choose intermediate inputs as a proxy to control for the correlation between inputs and the unobserved productivity shock. This has three significant advantages. First, the investment may respond only to the "news" in the unobserved term, while the intermediate inputs to the whole productivity term. This happens because the productivity shock has two components. The first one is the "news" that the investment responds to and is correlated with, and the other one is a firm shock, to which only the factors of production will respond. Secondly, intermediate inputs are not stable and they provide a simple link between the estimation strategy and the economic theory. Finally, the firms data show that more than half of the firms have zero investments because of the adjustment costs of capital, and thus, the data should be reduced to the firms with non-zero investments.

Pareto Distribution

In the literature, there is a discussion about how the Pareto distribution fits firm-level data well. Nigai (2017) mentions that the Pareto distribution is a better fit for the right tail of the distribution, while the log-normal seems to be a better fit for the left. Indeed, if I look at a TFP density distribution, the log-normal can better fit the left side. However, the ORBIS data show that the shape of the distributions across countries is different. Germany has more productive firms in each sector than the other countries. The purpose of this paper is not to study the mean productivity level but mainly to determine how shape can affect economies differently. Moreover, I can observe that in countries where the skewness is higher, the cumulative density on the left side is also lower than in other countries. This is an argument against log-normal distributions for comparison purposes. Therefore, the Pareto distribution seems better when comparing the two cumulative distributions.



(A.) Machinery Industry



(B.) Textiles Industry

Figure B1: Cumulative TFP distribution

Notes: The Figures display the cumulative productivity distribution by country for the Textiles and Machinery industries. I use Amadeus firm-level data.

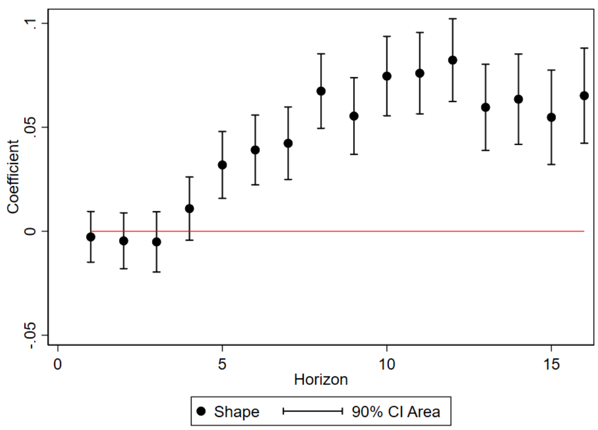
Appendix C Dynamic Price Discrimination and Concentration

In addition to the table displayed in the main text, the table below shows how a standard deviation in each variable affects the prices of French exporters after a shock, based on the coefficients:

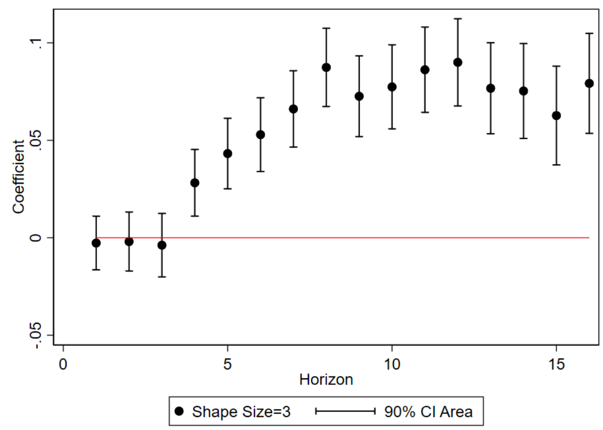
Variables for $Prod_{t-12}(1\ s.d.)$	Setup 1	Setup 2	Setup 3	Setup 4
Shape (Amadeus)	1.1 p.p			
Scale (Amadeus)	-0.2 p.p			
Shape (Compnet)		0.8 p.p		
Scale (Compnet)		0.42 p.p		
Skewness (Compnet)			-1.43 p.p	
Mean (Compnet)			2.4 p.p	
HHI revenue based				-0.5 p.p

Table C1: Responses related to the concentration/productivity parameters for the biggest French exporters in a 10 basis points monetary policy shock.

Notes: The table displays the peak values of the coefficients related to the interaction of the firms distribution variables and monetary policy shocks for the biggest French exporters.



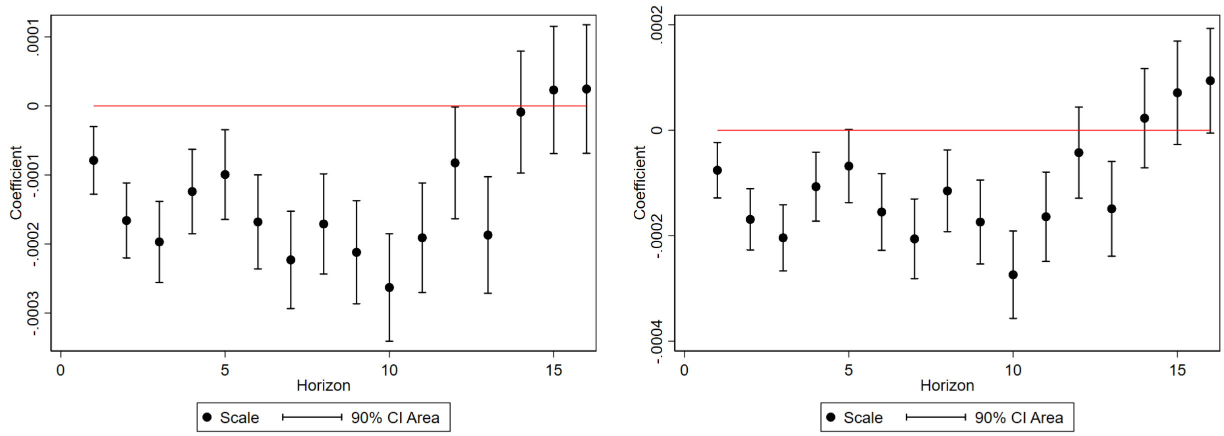
(A.) Shape



(B.) Shape (largest exporters)

Figure C1: Interaction of Pareto Shape and MP shock

Notes: The Figures display the coefficient related to the interaction of the Pareto shape parameter from Amadeus and the Monetary policy shock.

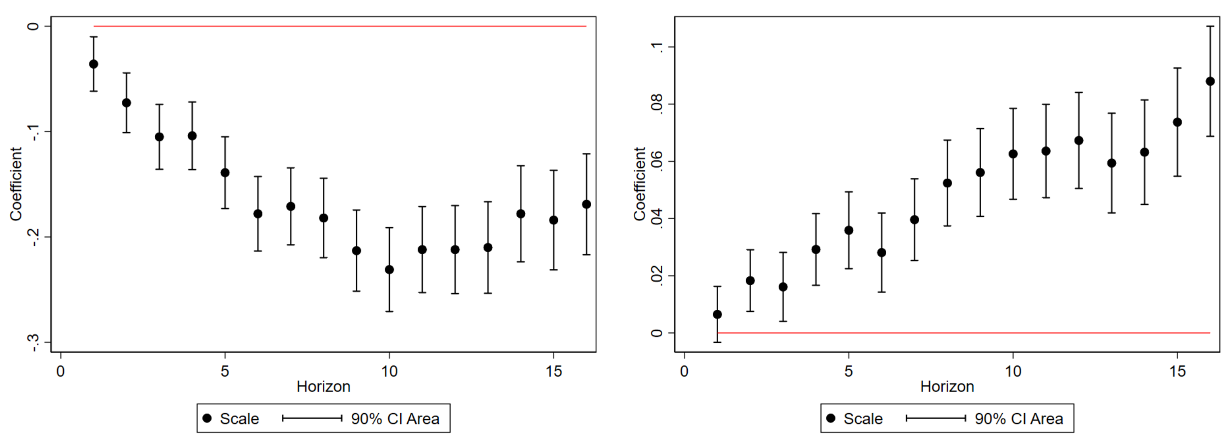


(A.) Scale

(B.) Scale (largest exporters)

Figure C2: Interaction of Pareto Scale and MP shock

Notes: The Figures display the coefficient related to the interaction of the Pareto scale parameter from Amadeus and the Monetary policy shock.

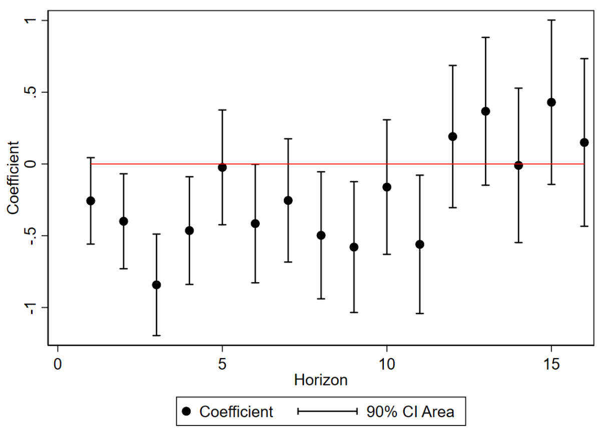


(A.) Skewness

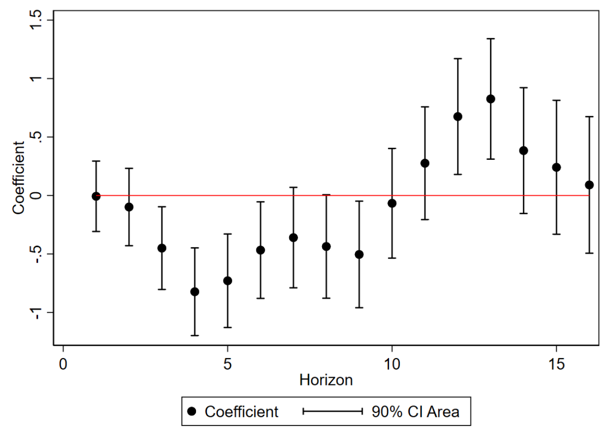
(B.) Mean

Figure C3: Interaction of TFP skewness and mean

Notes: The Figures display the coefficient related to the interaction of the skewness and mean value of the productivity distribution (CompNet) and the Monetary policy shock.



(A.) HHI



(B.) HHI (3 month)

Figure C4: Interaction of TFP skewness and mean

Notes: The figures display the coefficients related to the interaction between the HII and the monetary policy shock. The figure on the right-hand side presents the results based on the 3-month data.

Table C2: Detailed results for the Pareto shape parameter 1/2

	F1price_change	F2price_change	F3price_change	F4price_change	F5price_change	F6price_change	F7price_change	F8price_change
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.price_change	-0.467***	-0.482***	-0.498***	-0.513***	-0.522***	-0.529***	-0.540***	-0.552***
	(0.000726)	(0.000796)	(0.000860)	(0.000915)	(0.000966)	(0.00101)	(0.00105)	(0.00108)
L2.price_change	-0.210***	-0.230***	-0.249***	-0.264***	-0.272***	-0.285***	-0.298***	-0.315***
	(0.000798)	(0.000877)	(0.000950)	(0.00101)	(0.00107)	(0.00111)	(0.00116)	(0.00119)
L3.price_change	-0.0879***	-0.108***	-0.122***	-0.131***	-0.141***	-0.155***	-0.168***	-0.183***
	(0.000793)	(0.000875)	(0.000943)	(0.00100)	(0.00106)	(0.00111)	(0.00115)	(0.00119)
L4.price_change	-0.0320***	-0.0449***	-0.0504***	-0.0564***	-0.0659***	-0.0753***	-0.0853***	-0.0924***
	(0.000717)	(0.000787)	(0.000850)	(0.000904)	(0.000954)	(0.000999)	(0.00104)	(0.00107)
0.size#Belgium#MPshock	-0.649	0.195	0.761	0.405	0.225	0.512	-0.715	0.582
	(0.347)	(0.383)	(0.420)	(0.436)	(0.463)	(0.467)	(0.524)	(0.521)
0.size#Germany#MPshock	-0.942**	0.404	0.311	0.139	0.155	-0.0339	-1.187*	0.164
	(0.360)	(0.398)	(0.437)	(0.455)	(0.485)	(0.490)	(0.549)	(0.550)
0.size#Spain#MPshock	-0.811*	0.158	0.592	0.267	0.132	0.120	-1.164*	0.446
	(0.359)	(0.393)	(0.431)	(0.448)	(0.476)	(0.483)	(0.528)	(0.523)
0.size#Italy#MPshock	-0.796*	0.587	0.700	0.242	0.117	0.152	-1.254*	0.353
	(0.383)	(0.423)	(0.469)	(0.487)	(0.516)	(0.531)	(0.586)	(0.593)
0.size#Portugal#MPshock	-0.737	0.544	0.198	0.708	0.259	0.922	-0.884	0.360
	(0.404)	(0.441)	(0.491)	(0.539)	(0.550)	(0.583)	(0.606)	(0.617)
1.size#Belgium#MPshock	-0.471***	-0.138	0.199	0.140	0.0665	-0.415*	-0.317	0.0377
	(0.120)	(0.132)	(0.148)	(0.157)	(0.163)	(0.171)	(0.177)	(0.184)
1.size#Germany#MPshock	-0.409***	-0.0911	0.259	0.239	0.0960	-0.382*	-0.368*	-0.0145
	(0.121)	(0.133)	(0.150)	(0.159)	(0.164)	(0.173)	(0.179)	(0.185)
1.size#Spain#MPshock	-0.447***	-0.107	0.0742	0.266	0.151	-0.384*	-0.266	-0.0621
	(0.125)	(0.137)	(0.154)	(0.163)	(0.169)	(0.178)	(0.183)	(0.190)
1.size#Italy#MPshock	-0.405**	0.0310	0.345*	0.439*	0.236	-0.416*	-0.108	0.0730
	(0.140)	(0.155)	(0.175)	(0.184)	(0.192)	(0.202)	(0.208)	(0.216)
1.size#Portugal#MPshock	-0.691***	-0.125	-0.175	0.297	-0.179	-0.385	-0.397	-0.0618
	(0.149)	(0.166)	(0.186)	(0.195)	(0.209)	(0.219)	(0.221)	(0.233)
2.size#Belgium#MPshock	0.0928	0.0427	0.00312	0.0969	0.00461	0.0196	0.149*	-0.0744
	(0.0476)	(0.0525)	(0.0575)	(0.0598)	(0.0630)	(0.0667)	(0.0684)	(0.0701)
2.size#Germany#MPshock	0.0776	0.0282	-0.0674	0.0637	-0.0332	0.00830	0.0972	-0.0891
	(0.0472)	(0.0522)	(0.0573)	(0.0599)	(0.0631)	(0.0666)	(0.0685)	(0.0705)
2.size#Spain#MPshock	0.0828	0.0761	-0.0235	0.0629	-0.00921	0.0752	0.144*	-0.0248
	(0.0504)	(0.0556)	(0.0610)	(0.0635)	(0.0672)	(0.0707)	(0.0726)	(0.0748)
2.size#Italy#MPshock	0.127*	0.0939	-0.00173	0.130	-0.0132	0.0376	0.191*	0.00410
	(0.0547)	(0.0605)	(0.0662)	(0.0692)	(0.0727)	(0.0772)	(0.0787)	(0.0808)
2.size#Portugal#MPshock	0.00779	0.129	-0.106	0.134	0.0132	0.0528	0.116	-0.112
	(0.0603)	(0.0664)	(0.0721)	(0.0756)	(0.0789)	(0.0836)	(0.0860)	(0.0886)
3.size#Belgium#MPshock	0.0395	0.0114	0.0421	-0.0849**	-0.155***	-0.194***	-0.210***	-0.283***
	(0.0232)	(0.0256)	(0.0275)	(0.0289)	(0.0306)	(0.0320)	(0.0331)	(0.0341)
3.size#Germany#MPshock	-0.0316	-0.0255	-0.0481	-0.148***	-0.218***	-0.292***	-0.313***	-0.411***
	(0.0225)	(0.0248)	(0.0267)	(0.0281)	(0.0298)	(0.0312)	(0.0322)	(0.0332)
3.size#Spain#MPshock	0.00435	-0.00554	0.0105	-0.114***	-0.186***	-0.198***	-0.236***	-0.351***
	(0.0245)	(0.0269)	(0.0291)	(0.0306)	(0.0324)	(0.0338)	(0.0350)	(0.0360)
3.size#Italy#MPshock	-0.00673	0.00895	-0.0263	-0.150***	-0.217***	-0.261***	-0.288***	-0.420***
	(0.0261)	(0.0287)	(0.0310)	(0.0325)	(0.0345)	(0.0361)	(0.0373)	(0.0385)
3.size#Portugal#MPshock	-0.00715	-0.00407	-0.0187	-0.151***	-0.100**	-0.120**	-0.222***	-0.283***
	(0.0293)	(0.0321)	(0.0348)	(0.0366)	(0.0388)	(0.0407)	(0.0419)	(0.0433)
0.size#TFP Min (Amadeus)#MPshock	0.000369	-0.00157*	0.000654	0.000245	0.00117	0.00200*	0.00167	0.00131
	(0.000636)	(0.000710)	(0.000780)	(0.000804)	(0.000862)	(0.000894)	(0.000968)	(0.00104)
1.size#TFP Min (Amadeus)#MPshock	0.000581*	0.000269	-0.0000338	0.000175	0.000159	0.000362	0.000857*	-0.000262
	(0.000260)	(0.000284)	(0.000334)	(0.000341)	(0.000364)	(0.000379)	(0.000391)	(0.000421)
2.size#TFP Min (Amadeus)#MPshock	-0.000143	-0.0000123	-0.0000352	-0.0000325	-0.000173	0.00000103	-0.0000865	-0.000263
	(0.0000938)	(0.000105)	(0.000115)	(0.000119)	(0.000127)	(0.000133)	(0.000137)	(0.000141)
3.size#TFP Min (Amadeus)#MPshock	-0.0000759*	-0.000169***	-0.000204***	-0.000107**	-0.0000680	-0.000155***	-0.000206***	-0.000115*
	(0.0000319)	(0.0000353)	(0.0000381)	(0.0000397)	(0.0000422)	(0.0000442)	(0.0000459)	(0.0000471)
0.size#TFP Shape (Amadeus)#MPshock	0.334*	-0.0198	-0.212	-0.129	-0.117	-0.174	0.359	-0.175
	(0.133)	(0.148)	(0.163)	(0.169)	(0.179)	(0.180)	(0.204)	(0.200)
1.size#TFP Shape (Amadeus)#MPshock	0.168***	0.0380	-0.0741	-0.0920	-0.0485	0.190**	0.107	0.00820
	(0.0446)	(0.0495)	(0.0553)	(0.0586)	(0.0606)	(0.0637)	(0.0662)	(0.0686)
2.size#TFP Shape (Amadeus)#MPshock	-0.0339	-0.0166	0.00984	-0.0405	0.00100	-0.0313	-0.0640*	0.00304
	(0.0174)	(0.0192)	(0.0210)	(0.0218)	(0.0229)	(0.0243)	(0.0249)	(0.0255)
3.size#TFP Shape (Amadeus)#MPshock	-0.00269	-0.00194	-0.00380	0.0282**	0.0432***	0.0529***	0.0661***	0.0874***
	(0.00836)	(0.00919)	(0.00990)	(0.0104)	(0.0110)	(0.0115)	(0.0119)	(0.0122)
N	2067230	1988166	1915747	1852666	1789181	1731005	1678980	1639648
adj. R^2	0.172	0.164	0.160	0.158	0.156	0.155	0.157	0.162

Notes: Standard errors in parenthesis, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.
The table shows detailed results for the baseline specification by including country-MP interactions and the Pareto shape and scale parameters from Amadeus.

Table C3: Detailed results for the Pareto shape parameter 2/2

	F9price_change	F10price_change	F11price_change	F12price_change	F13price_change	F14price_change	F15price_change	F16price_change
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.price_change	-0.559***	-0.560***	-0.542***	-0.503***	-0.520***	-0.535***	-0.548***	-0.557***
	(0.00111)	(0.00115)	(0.00119)	(0.00124)	(0.00131)	(0.00137)	(0.00142)	(0.00147)
L2.price_change	-0.318***	-0.301***	-0.251***	-0.250***	-0.271***	-0.288***	-0.302***	-0.316***
	(0.00123)	(0.00127)	(0.00132)	(0.00137)	(0.00144)	(0.00151)	(0.00157)	(0.00162)
L3.price_change	-0.170***	-0.123***	-0.115***	-0.125***	-0.142***	-0.157***	-0.172***	-0.181***
	(0.00123)	(0.00127)	(0.00131)	(0.00136)	(0.00144)	(0.00150)	(0.00156)	(0.00161)
L4.price_change	-0.0513***	-0.0420***	-0.0457***	-0.0544***	-0.0663***	-0.0765***	-0.0841***	-0.0920***
	(0.00111)	(0.00114)	(0.00117)	(0.00122)	(0.00129)	(0.00135)	(0.00140)	(0.00145)
0.size#Belgium#MP Shock	0.313	-0.141	1.165*	-0.529	1.592**	-0.157	1.110	1.261
	(0.536)	(0.558)	(0.593)	(0.588)	(0.613)	(0.668)	(0.748)	(0.726)
0.size#Germany#MP Shock	0.0236	-0.399	0.830	-0.607	1.203	-0.567	0.0598	1.585*
	(0.567)	(0.589)	(0.615)	(0.619)	(0.645)	(0.699)	(0.788)	(0.750)
0.size#Spain#MP Shock	0.0819	-0.397	0.640	-0.853	0.786	-0.556	0.463	0.966
	(0.550)	(0.575)	(0.599)	(0.599)	(0.633)	(0.668)	(0.756)	(0.726)
0.size#Italy#MP Shock	0.00329	-0.783	0.997	-0.979	0.724	-0.501	0.0912	1.769*
	(0.610)	(0.630)	(0.664)	(0.672)	(0.697)	(0.784)	(0.855)	(0.809)
0.size#Portugal#MP Shock	-0.287	-0.0293	0.279	-1.831*	0.967	-0.781	0.719	0.546
	(0.642)	(0.663)	(0.783)	(0.760)	(0.794)	(0.857)	(0.925)	(0.875)
1.size#Belgium#MP Shock	0.120	-0.261	-0.129	0.129	0.0895	-0.0884	-0.297	0.277
	(0.192)	(0.200)	(0.205)	(0.211)	(0.223)	(0.237)	(0.253)	(0.247)
1.size#Germany#MP Shock	0.227	-0.247	0.0148	0.0944	-0.0797	-0.0799	-0.344	0.244
	(0.194)	(0.202)	(0.207)	(0.213)	(0.225)	(0.239)	(0.254)	(0.248)
1.size#Spain#MP Shock	0.178	-0.200	0.00956	0.122	0.00820	-0.0677	-0.370	0.282
	(0.198)	(0.206)	(0.210)	(0.218)	(0.231)	(0.245)	(0.259)	(0.252)
1.size#Italy#MP Shock	0.170	-0.0633	0.217	0.328	0.107	0.194	-0.0442	0.435
	(0.226)	(0.236)	(0.244)	(0.252)	(0.265)	(0.282)	(0.297)	(0.292)
1.size#Portugal#MP Shock	-0.0306	-0.413	-0.181	0.0175	-0.182	-0.203	-0.386	0.265
	(0.243)	(0.251)	(0.257)	(0.269)	(0.281)	(0.291)	(0.317)	(0.309)
2.size#Belgium#MP Shock	-0.0311	-0.244**	-0.230**	-0.200*	-0.0966	-0.162	-0.129	-0.181*
	(0.0725)	(0.0754)	(0.0782)	(0.0788)	(0.0821)	(0.0868)	(0.0911)	(0.0912)
2.size#Germany#MP Shock	-0.0957	-0.285***	-0.292***	-0.301***	-0.152	-0.224**	-0.254**	-0.333***
	(0.0731)	(0.0759)	(0.0790)	(0.0791)	(0.0824)	(0.0869)	(0.0911)	(0.0914)
2.size#Spain#MP Shock	-0.0390	-0.232**	-0.234**	-0.217**	-0.0674	-0.153	-0.152	-0.269**
	(0.0771)	(0.0798)	(0.0830)	(0.0836)	(0.0873)	(0.0921)	(0.0964)	(0.0971)
2.size#Italy#MP Shock	-0.0466	-0.184*	-0.188*	-0.322***	-0.118	-0.153	-0.129	-0.195
	(0.0835)	(0.0870)	(0.0897)	(0.0905)	(0.0948)	(0.100)	(0.106)	(0.106)
2.size#Portugal#MP Shock	-0.122	-0.282**	-0.125	-0.388***	-0.164	-0.294**	-0.306**	-0.343**
	(0.0914)	(0.0941)	(0.0969)	(0.0972)	(0.102)	(0.107)	(0.112)	(0.113)
3.size#Belgium#MP Shock	-0.260***	-0.273***	-0.341***	-0.361***	-0.321***	-0.333***	-0.317***	-0.386***
	(0.0350)	(0.0363)	(0.0370)	(0.0378)	(0.0394)	(0.0411)	(0.0429)	(0.0435)
3.size#Germany#MP Shock	-0.390***	-0.379***	-0.458***	-0.484***	-0.442***	-0.456***	-0.410***	-0.496***
	(0.0341)	(0.0354)	(0.0361)	(0.0369)	(0.0384)	(0.0401)	(0.0418)	(0.0423)
3.size#Spain#MP Shock	-0.309***	-0.310***	-0.385***	-0.407***	-0.347***	-0.389***	-0.365***	-0.415***
	(0.0370)	(0.0385)	(0.0392)	(0.0401)	(0.0418)	(0.0437)	(0.0456)	(0.0462)
3.size#Italy#MP Shock	-0.351***	-0.365***	-0.422***	-0.437***	-0.408***	-0.412***	-0.363***	-0.474***
	(0.0396)	(0.0410)	(0.0417)	(0.0427)	(0.0445)	(0.0466)	(0.0486)	(0.0492)
3.size#Portugal#MP Shock	-0.304***	-0.252***	-0.320***	-0.331***	-0.303***	-0.330***	-0.223***	-0.370***
	(0.0444)	(0.0460)	(0.0470)	(0.0481)	(0.0503)	(0.0523)	(0.0545)	(0.0552)
0.size#TFP Scale (Amadeus)#MP Shock	0.000973	-0.000625	-0.0000600	0.000681	-0.000748	0.00123	0.00221	0.00283
	(0.000996)	(0.00114)	(0.00117)	(0.00114)	(0.00117)	(0.00128)	(0.00154)	(0.00162)
1.size#TFP Scale (Amadeus)#MP Shock	-0.000114	0.000640	-0.000328	0.000127	-0.00000555	0.0000351	-0.00000914	-0.000269
	(0.000423)	(0.000442)	(0.000443)	(0.000462)	(0.000486)	(0.000516)	(0.000553)	(0.000539)
2.size#TFP Scale (Amadeus)#MP Shock	-0.000113	0.000174	0.0000388	-0.000102	-0.000110	0.000113	-0.0000904	-0.000264
	(0.000147)	(0.000152)	(0.000156)	(0.000159)	(0.000167)	(0.000173)	(0.000183)	(0.000183)
3.size#TFP Scale (Amadeus)#MP Shock	-0.000174***	-0.000274***	-0.000164**	-0.0000425	-0.000149**	0.0000228	0.0000710	0.0000938
	(0.0000484)	(0.0000504)	(0.0000514)	(0.0000525)	(0.0000546)	(0.0000572)	(0.0000596)	(0.0000603)
0.size#TFP Shape (Amadeus)#MP Shock	-0.0303	0.170	-0.316	0.336	-0.445	0.178	-0.242	-0.548*
	(0.208)	(0.214)	(0.227)	(0.228)	(0.238)	(0.258)	(0.293)	(0.274)
1.size#TFP Shape (Amadeus)#MP Shock	-0.0589	0.0749	0.0367	-0.0647	-0.00950	0.0222	0.129	-0.140
	(0.0717)	(0.0750)	(0.0764)	(0.0789)	(0.0835)	(0.0887)	(0.0937)	(0.0912)
2.size#TFP Shape (Amadeus)#MP Shock	0.00390	0.0750**	0.0558	0.0703*	0.00971	0.0265	0.0278	0.0473
	(0.0264)	(0.0275)	(0.0286)	(0.0286)	(0.0298)	(0.0315)	(0.0331)	(0.0331)
$3.size\#TFPShape(Amadeus)\#MPShock$	0.0726***	0.0774***	0.0862***	0.0900***	0.0767***	0.0753***	0.0627***	0.0792***
	(0.0126)	(0.0131)	(0.0133)	(0.0136)	(0.0142)	(0.0148)	(0.0154)	(0.0156)
N	1595211	1548600	1500001	1450523	1394896	1348585	1307909	1271996
adj. R^2	0.162	0.160	0.151	0.136	0.138	0.141	0.144	0.147

Notes: Standard errors in parenthesis, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.
The table shows detailed results for the baseline specification by including country-MP interactions and the Pareto shape and scale parameters from Amadeus.

Table C4: Detailed results for HHI 1/2

	F1price_change	F2price_change	F3price_change	F4price_change	F5price_change	F6price_change	F7price_change	F8price_change
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.price_change	-0.469***	-0.483***	-0.502***	-0.515***	-0.524***	-0.527***	-0.540***	-0.553***
	(0.000700)	(0.000765)	(0.000826)	(0.000878)	(0.000926)	(0.000968)	(0.00101)	(0.00103)
L2.price_change	-0.210***	-0.234***	-0.252***	-0.266***	-0.270***	-0.282***	-0.297***	-0.317***
	(0.000769)	(0.000844)	(0.000914)	(0.000967)	(0.00102)	(0.00107)	(0.00111)	(0.00114)
L3.price_change	-0.0906***	-0.112***	-0.125***	-0.129***	-0.138***	-0.152***	-0.169***	-0.185***
	(0.000765)	(0.000841)	(0.000908)	(0.000964)	(0.00102)	(0.00106)	(0.00111)	(0.00114)
L4.price_change	-0.0330***	-0.0470***	-0.0490***	-0.0542***	-0.0627***	-0.0749***	-0.0841***	-0.0960***
	(0.000691)	(0.000757)	(0.000819)	(0.000868)	(0.000916)	(0.000958)	(0.000999)	(0.00103)
Belgium#MP Shock	0.0238**	0.00171	0.0446***	-0.00981	-0.0410***	-0.0493***	-0.0429***	-0.0590***
	(0.00872)	(0.00952)	(0.0104)	(0.0110)	(0.0116)	(0.0120)	(0.0124)	(0.0129)
Germany#MP Shock	-0.0313***	-0.0314***	-0.0580***	-0.0703***	-0.0998***	-0.143***	-0.148***	-0.180***
	(0.00709)	(0.00778)	(0.00849)	(0.00895)	(0.00950)	(0.00991)	(0.0103)	(0.0106)
Spain#MP Shock	-0.00592	-0.00742	-0.00736	-0.0424***	-0.0665***	-0.0553***	-0.0721***	-0.117***
	(0.00993)	(0.0109)	(0.0119)	(0.0125)	(0.0133)	(0.0138)	(0.0143)	(0.0148)
Italy#MP Shock	-0.0110	0.000353	-0.0410***	-0.0590***	-0.0902***	-0.116***	-0.106***	-0.165***
	(0.00945)	(0.0104)	(0.0113)	(0.0118)	(0.0125)	(0.0132)	(0.0135)	(0.0140)
Netherlands#MP Shock	-0.00531	0.0141	0.00229	-0.0264	-0.0556*	-0.0819***	-0.0976***	-0.128***
	(0.0166)	(0.0182)	(0.0198)	(0.0210)	(0.0223)	(0.0231)	(0.0240)	(0.0250)
Portugal#MP Shock	-0.0250	0.0213	-0.0466*	-0.0392	0.00117	0.0121	-0.0569*	-0.0690*
	(0.0182)	(0.0199)	(0.0218)	(0.0230)	(0.0242)	(0.0254)	(0.0262)	(0.0272)
HHI#MP Shock	-0.257	-0.399*	-0.842***	-0.464*	-0.0236	-0.415	-0.254	-0.497*
	(0.154)	(0.168)	(0.183)	(0.193)	(0.205)	(0.212)	(0.220)	(0.227)
N	2224293	2139794	2062358	1994846	1926826	1863944	1807759	1765453
adj. R^2	0.174	0.165	0.163	0.160	0.158	0.155	0.157	0.163

Notes: Standard errors in parenthesis, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.
The table shows detailed results for the baseline specification by including country-MP interactions and the HHI variable from Amadeus.

Table C5: Detailed results for HHI 2/2

	F9price_change	F10price_change	F11price_change	F12price_change	F13price_change	F14price_change	F15price_change	F16price_change
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.price_change	-0.561***	-0.561***	-0.546***	-0.501***	-0.523***	-0.537***	-0.552***	-0.559***
	(0.00107)	(0.00110)	(0.00114)	(0.00119)	(0.00126)	(0.00131)	(0.00136)	(0.00141)
L2.price_change	-0.319***	-0.304***	-0.249***	-0.250***	-0.273***	-0.292***	-0.304***	-0.318***
	(0.00118)	(0.00122)	(0.00126)	(0.00131)	(0.00139)	(0.00145)	(0.00150)	(0.00155)
L3.price_change	-0.173***	-0.121***	-0.115***	-0.125***	-0.146***	-0.160***	-0.174***	-0.179***
	(0.00118)	(0.00122)	(0.00126)	(0.00130)	(0.00138)	(0.00144)	(0.00150)	(0.00155)
L4.price_change	-0.0489***	-0.0414***	-0.0440***	-0.0554***	-0.0673***	-0.0789***	-0.0825***	-0.0884***
	(0.00106)	(0.00110)	(0.00113)	(0.00117)	(0.00124)	(0.00130)	(0.00135)	(0.00139)
Belgium#MP Shock	-0.0595***	-0.0834***	-0.108***	-0.116***	-0.127***	-0.124***	-0.132***	-0.156***
	(0.0133)	(0.0136)	(0.0141)	(0.0145)	(0.0151)	(0.0157)	(0.0164)	(0.0168)
Germany#MP Shock	-0.188***	-0.187***	-0.222***	-0.239***	-0.245***	-0.238***	-0.238***	-0.276***
	(0.0109)	(0.0112)	(0.0116)	(0.0119)	(0.0124)	(0.0130)	(0.0136)	(0.0138)
Spain#MP Shock	-0.110***	-0.115***	-0.151***	-0.161***	-0.152***	-0.170***	-0.178***	-0.197***
	(0.0152)	(0.0158)	(0.0162)	(0.0166)	(0.0173)	(0.0182)	(0.0190)	(0.0192)
Italy#MP Shock	-0.153***	-0.154***	-0.166***	-0.188***	-0.205***	-0.182***	-0.170***	-0.220***
	(0.0144)	(0.0150)	(0.0153)	(0.0156)	(0.0162)	(0.0171)	(0.0178)	(0.0181)
Netherlands#MP Shock	-0.0723**	-0.132***	-0.118***	-0.164***	-0.181***	-0.158***	-0.158***	-0.176***
	(0.0259)	(0.0267)	(0.0275)	(0.0282)	(0.0295)	(0.0310)	(0.0325)	(0.0331)
Portugal#MP Shock	-0.115***	-0.0730*	-0.0619*	-0.139***	-0.141***	-0.156***	-0.119***	-0.170***
	(0.0279)	(0.0288)	(0.0296)	(0.0303)	(0.0318)	(0.0329)	(0.0344)	(0.0349)
HHI#MP Shock	-0.579*	-0.161	-0.560*	0.191	0.367	-0.00964	0.430	0.150
	(0.234)	(0.241)	(0.248)	(0.255)	(0.266)	(0.278)	(0.296)	(0.300)
N	1717516	1667417	1615358	1562132	1502357	1452685	1408922	1370210
adj. R^2	0.164	0.161	0.153	0.135	0.139	0.142	0.145	0.147

Notes: Standard errors in parenthesis, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.
The table shows detailed results for the baseline specification by including country-MP interactions and the HHI variable from Amadeus.

Table C6: Detailed results for HHI (3-month) 1/2

	Fprice3m_change	F1price3m_change	F2price3m_change	F3price3m_change	F4price3m_change	F5price3m_change	F6price3m_change	F7price3m_change
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L6.price3m_change	-0.458***	-0.470***	-0.472***	-0.484***	-0.469***	-0.450***	-0.436***	-0.455***
	(0.000606)	(0.000641)	(0.000677)	(0.000700)	(0.000721)	(0.000739)	(0.000754)	(0.000783)
L9.price3m_change	-0.213***	-0.216***	-0.199***	-0.192***	-0.202***	-0.208***	-0.206***	-0.215***
	(0.000621)	(0.000655)	(0.000687)	(0.000711)	(0.000736)	(0.000756)	(0.000771)	(0.000801)
L12.price3m_change	-0.0367***	-0.0411***	-0.0428***	-0.0431***	-0.0460***	-0.0496***	-0.0489***	-0.0490***
	(0.000419)	(0.000438)	(0.000459)	(0.000473)	(0.000488)	(0.000499)	(0.000507)	(0.000526)
Belgium#MP Shock	0.00271	-0.0341***	-0.0424***	-0.0203	-0.00828	-0.0274*	-0.0690***	-0.0957***
	(0.00996)	(0.0103)	(0.0108)	(0.0111)	(0.0114)	(0.0116)	(0.0118)	(0.0122)
Germany#MP Shock	-0.0212**	-0.0674***	-0.0938***	-0.105***	-0.0967***	-0.102***	-0.148***	-0.175***
	(0.00766)	(0.00800)	(0.00836)	(0.00862)	(0.00888)	(0.00907)	(0.00920)	(0.00951)
Spain#MP Shock	0.0139	-0.0128	-0.0107	-0.0298*	-0.0251*	-0.0325**	-0.0695***	-0.0909***
	(0.0105)	(0.0109)	(0.0115)	(0.0118)	(0.0122)	(0.0125)	(0.0127)	(0.0131)
Italy#MP Shock	0.00824	-0.0346**	-0.0684***	-0.107***	-0.112***	-0.131***	-0.170***	-0.193***
	(0.0101)	(0.0106)	(0.0111)	(0.0114)	(0.0118)	(0.0121)	(0.0122)	(0.0126)
Netherlands#MP Shock	0.0646***	0.0272	0.0427*	0.0492*	0.0311	-0.00950	-0.0232	-0.0123
	(0.0182)	(0.0189)	(0.0198)	(0.0204)	(0.0211)	(0.0217)	(0.0220)	(0.0228)
Portugal#MP Shock	0.0200	-0.0244	-0.0261	-0.0278	-0.0220	-0.0407	-0.0949***	-0.0964***
	(0.0193)	(0.0201)	(0.0211)	(0.0217)	(0.0224)	(0.0229)	(0.0233)	(0.0240)
7.country#MP Shock	-0.412	-1.159*	-1.132*	-0.662	-0.497	-0.204	-0.801	-0.0799
	(0.455)	(0.463)	(0.484)	(0.497)	(0.504)	(0.524)	(0.523)	(0.577)
Belgium#Inf Shock	-0.0426***	-0.0615***	-0.0647***	-0.0299*	0.0210	0.0348**	0.0270*	0.0101
	(0.0113)	(0.0117)	(0.0121)	(0.0124)	(0.0127)	(0.0129)	(0.0131)	(0.0136)
Germany#Inf Shock	0.0415***	0.0471***	0.0467***	0.0724***	0.121***	0.155***	0.131***	0.123***
	(0.00869)	(0.00901)	(0.00938)	(0.00960)	(0.00987)	(0.0101)	(0.0102)	(0.0106)
Spain#Inf Shock	0.0130	0.0393**	0.0557***	0.0928***	0.133***	0.144***	0.117***	0.123***
	(0.0119)	(0.0123)	(0.0128)	(0.0131)	(0.0135)	(0.0137)	(0.0139)	(0.0144)
Italy#Inf Shock	0.130***	0.107***	0.0850***	0.105***	0.135***	0.125***	0.105***	0.133***
	(0.0115)	(0.0119)	(0.0124)	(0.0126)	(0.0130)	(0.0132)	(0.0134)	(0.0139)
Netherlands#Inf Shock	0.00131	-0.0232	-0.0246	0.0196	0.0431	0.0612**	0.0712**	0.0881***
	(0.0205)	(0.0212)	(0.0221)	(0.0226)	(0.0232)	(0.0237)	(0.0240)	(0.0251)
Portugal#Inf Shock	0.0180	0.0251	0.0396	0.0855***	0.131***	0.168***	0.171***	0.167***
	(0.0219)	(0.0227)	(0.0238)	(0.0244)	(0.0250)	(0.0255)	(0.0258)	(0.0268)
7.country#Inf Shock	-1.023	-0.846	-0.381	0.406	0.135	0.992	0.650	0.286
	(0.522)	(0.527)	(0.545)	(0.562)	(0.561)	(0.629)	(0.627)	(0.648)
HHI#MP Shock	-0.00673	-0.0985	-0.450**	-0.823***	-0.729***	-0.467**	-0.360*	-0.436*
	(0.150)	(0.157)	(0.164)	(0.168)	(0.173)	(0.177)	(0.179)	(0.185)
HHI#Inf Shock	0.827***	0.959***	0.784***	0.310	0.166	0.121	0.136	0.171
	(0.170)	(0.176)	(0.184)	(0.188)	(0.193)	(0.196)	(0.199)	(0.206)
N	2754068	2572791	2449069	2360367	2276136	2199942	2127173	2056341
adj. R^2	0.224	0.196	0.182	0.185	0.176	0.165	0.159	0.166

Notes: Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.
The table presents detailed results for the baseline specification, including country-MP interactions and the HHI variable from Amadeus. All variables are measured in 3-month moving periods.

Table C7: Detailed results for HHI (3-month) 2/2

	F8price3m_change	F9price3m_change	F10price3m_change	F11price3m_change	F12price3m_change	F13price3m_change	F14price3m_change	F15price3m_change	F16price3m_change
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L6.price3m_change	-0.472***	-0.478***	-0.482***	-0.483***	-0.487***	-0.484***	-0.490***	-0.502***	-0.489***
	(0.000813)	(0.000838)	(0.000863)	(0.000887)	(0.000909)	(0.000940)	(0.000967)	(0.000988)	(0.00101)
L9.price3m_change	-0.224***	-0.231***	-0.232***	-0.236***	-0.247***	-0.234***	-0.221***	-0.215***	-0.224***
	(0.000830)	(0.000855)	(0.000883)	(0.000909)	(0.000929)	(0.000956)	(0.000977)	(0.001000)	(0.00103)
L12.price3m_change	-0.0529***	-0.0609***	-0.0554***	-0.0474***	-0.0440***	-0.0462***	-0.0489***	-0.0487***	-0.0504***
	(0.000546)	(0.000562)	(0.000577)	(0.000594)	(0.000607)	(0.000626)	(0.000642)	(0.000656)	(0.000673)
Belgium#MP Shock	-0.104***	-0.0833***	-0.0919***	-0.122***	-0.152***	-0.149***	-0.147***	-0.142***	-0.147***
	(0.0126)	(0.0130)	(0.0133)	(0.0136)	(0.0139)	(0.0142)	(0.0144)	(0.0146)	(0.0149)
Germany#MP Shock	-0.176***	-0.144***	-0.137***	-0.171***	-0.202***	-0.205***	-0.188***	-0.168***	-0.146***
	(0.00984)	(0.0101)	(0.0104)	(0.0106)	(0.0108)	(0.0110)	(0.0112)	(0.0114)	(0.0116)
Spain#MP Shock	-0.0816***	-0.0298*	-0.0294*	-0.0866***	-0.124***	-0.129***	-0.0681***	-0.0727***	-0.105***
	(0.0136)	(0.0140)	(0.0143)	(0.0146)	(0.0149)	(0.0152)	(0.0155)	(0.0157)	(0.0161)
Italy#MP Shock	-0.165***	-0.120***	-0.0765***	-0.132***	-0.138***	-0.145***	-0.137***	-0.124***	-0.113***
	(0.0130)	(0.0133)	(0.0136)	(0.0139)	(0.0141)	(0.0144)	(0.0147)	(0.0149)	(0.0153)
Netherlands#MP Shock	-0.0267	0.000602	0.0140	-0.0703**	-0.104***	-0.102***	-0.0507	-0.0597*	-0.0845**
	(0.0236)	(0.0243)	(0.0250)	(0.0256)	(0.0262)	(0.0268)	(0.0272)	(0.0276)	(0.0283)
Portugal#MP Shock	-0.102***	-0.0817**	-0.0817**	-0.153***	-0.158***	-0.191***	-0.151***	-0.157***	-0.143***
	(0.0249)	(0.0255)	(0.0261)	(0.0268)	(0.0273)	(0.0279)	(0.0283)	(0.0288)	(0.0294)
7.country#MP Shock	-0.0575	-0.247	-0.472	-1.504*	-1.388*	-0.174	0.202	-0.151	-0.830
	(0.564)	(0.569)	(0.580)	(0.632)	(0.643)	(0.657)	(0.707)	(0.657)	(0.671)
Belgium#Inf Shock	0.0236	0.0647***	0.0755***	0.0654***	0.0403**	0.0382*	0.0403*	0.0782***	0.0974***
	(0.0142)	(0.0145)	(0.0149)	(0.0152)	(0.0155)	(0.0158)	(0.0162)	(0.0164)	(0.0168)
Germany#Inf Shock	0.126***	0.151***	0.172***	0.159***	0.124***	0.0959***	0.0959***	0.114***	0.107***
	(0.0110)	(0.0113)	(0.0116)	(0.0118)	(0.0120)	(0.0123)	(0.0126)	(0.0128)	(0.0131)
Spain#Inf Shock	0.132***	0.215***	0.225***	0.210***	0.170***	0.163***	0.179***	0.192***	0.181***
	(0.0151)	(0.0156)	(0.0160)	(0.0163)	(0.0166)	(0.0170)	(0.0174)	(0.0176)	(0.0180)
Italy#Inf Shock	0.175***	0.254***	0.293***	0.276***	0.237***	0.186***	0.154***	0.171***	0.146***
	(0.0146)	(0.0150)	(0.0154)	(0.0157)	(0.0159)	(0.0163)	(0.0166)	(0.0168)	(0.0172)
Netherlands#Inf Shock	0.117***	0.179***	0.183***	0.144***	0.0752**	0.0649*	0.0708*	0.0923**	0.0826**
	(0.0264)	(0.0272)	(0.0279)	(0.0284)	(0.0290)	(0.0298)	(0.0305)	(0.0310)	(0.0317)
Portugal#Inf Shock	0.168***	0.165***	0.180***	0.162***	0.165***	0.160***	0.188***	0.223***	0.252***
	(0.0280)	(0.0288)	(0.0295)	(0.0301)	(0.0305)	(0.0314)	(0.0321)	(0.0326)	(0.0333)
7.country#Inf Shock	-0.0297	0.554	-0.147	-0.430	-0.139	0.452	0.891	-0.249	-0.660
	(0.676)	(0.690)	(0.751)	(0.711)	(0.719)	(0.735)	(0.791)	(0.756)	(0.759)
HHI#MP Shock	-0.504**	-0.0667	0.276	0.675**	0.826***	0.384	0.241	0.0903	0.555*
	(0.192)	(0.198)	(0.203)	(0.209)	(0.214)	(0.220)	(0.223)	(0.227)	(0.232)
HHI#Inf Shock	0.000254	0.258	0.431	0.658**	0.624**	0.0920	-0.134	-0.516*	-0.364
	(0.215)	(0.221)	(0.227)	(0.232)	(0.236)	(0.243)	(0.249)	(0.253)	(0.259)
N	1988879	1920733	1854724	1796398	1742560	1685206	1629777	1576279	1523549
adj. R^2	0.171	0.173	0.174	0.173	0.176	0.172	0.173	0.180	0.175

Notes: Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.
The table presents detailed results for the baseline specification, including country-MP interactions and the HHI variable from Amadeus. All variables are measured in 3-month moving periods.

Table C8: Detailed results for HHI 1/2

	F1price_change	F2price_change	F3price_change	F4price_change	F5price_change	F6price_change	F7price_change	F8price_change
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.price_change	-0.469***	-0.483***	-0.502***	-0.515***	-0.524***	-0.527***	-0.540***	-0.553***
	(0.000700)	(0.000765)	(0.000826)	(0.000878)	(0.000926)	(0.000968)	(0.00101)	(0.00103)
L2.price_change	-0.210***	-0.234***	-0.252***	-0.266***	-0.270***	-0.282***	-0.297***	-0.317***
	(0.000769)	(0.000844)	(0.000914)	(0.000967)	(0.00102)	(0.00107)	(0.00111)	(0.00114)
L3.price_change	-0.0906***	-0.112***	-0.125***	-0.129***	-0.138***	-0.152***	-0.169***	-0.185***
	(0.000765)	(0.000841)	(0.000908)	(0.000964)	(0.00102)	(0.00106)	(0.00111)	(0.00114)
L4.price_change	-0.0330***	-0.0470***	-0.0490***	-0.0542***	-0.0627***	-0.0749***	-0.0841***	-0.0960***
	(0.000691)	(0.000757)	(0.000819)	(0.000868)	(0.000916)	(0.000958)	(0.000999)	(0.00103)
0.size#Belgium#MP Shock	0.132	0.112	0.400***	0.156	0.0617	0.125	0.257	0.243
	(0.0831)	(0.0915)	(0.107)	(0.115)	(0.124)	(0.126)	(0.136)	(0.141)
0.size#Germany#MP Shock	-0.0282	0.119	-0.0922	-0.0500	0.148	-0.148	-0.164	-0.118
	(0.0797)	(0.0864)	(0.0972)	(0.103)	(0.111)	(0.113)	(0.118)	(0.127)
0.size#Spain#MP Shock	0.200*	0.106	0.223	0.0358	0.0804	-0.0515	-0.0918	0.144
	(0.0946)	(0.102)	(0.115)	(0.123)	(0.128)	(0.131)	(0.141)	(0.145)
0.size#Italy#MP Shock	0.0561	0.276*	-0.108	0.132	0.172	-0.0908	-0.117	-0.0996
	(0.127)	(0.138)	(0.160)	(0.168)	(0.179)	(0.189)	(0.197)	(0.207)
0.size#Netherlands#MP Shock	0.475**	0.424**	0.336	0.360	-0.0819	-0.253	0.0892	-0.172
	(0.152)	(0.162)	(0.186)	(0.209)	(0.211)	(0.219)	(0.223)	(0.233)
0.size#Portugal#MP Shock	0.0495	0.396**	-0.312*	0.132	0.190	0.217	0.0204	-0.133
	(0.122)	(0.132)	(0.159)	(0.177)	(0.181)	(0.190)	(0.193)	(0.203)
1.size#Belgium#MP Shock	0.0287	0.00657	0.0807*	-0.0453	-0.0302	0.0913*	-0.00637	0.100*
	(0.0322)	(0.0351)	(0.0396)	(0.0420)	(0.0445)	(0.0465)	(0.0477)	(0.0502)
1.size#Germany#MP Shock	0.0406	0.0297	0.0810*	0.0399	0.0130	0.102*	-0.0457	-0.00780
	(0.0329)	(0.0352)	(0.0393)	(0.0421)	(0.0445)	(0.0464)	(0.0469)	(0.0487)
1.size#Spain#MP Shock	0.0211	0.0367	-0.0487	0.0590	0.0658	0.0964	0.0486	-0.0387
	(0.0458)	(0.0501)	(0.0568)	(0.0591)	(0.0623)	(0.0650)	(0.0685)	(0.0703)
1.size#Italy#MP Shock	0.122*	0.158*	0.0856	0.217**	0.170*	0.0855	0.196*	0.0607
	(0.0603)	(0.0665)	(0.0754)	(0.0804)	(0.0829)	(0.0867)	(0.0897)	(0.0932)
1.size#Netherlands#MP Shock	-0.0163	0.142	0.0877	0.0599	0.0968	-0.0592	-0.124	0.100
	(0.0720)	(0.0787)	(0.0874)	(0.0954)	(0.101)	(0.105)	(0.107)	(0.111)
1.size#Portugal#MP Shock	-0.115	0.0574	-0.264*	0.0650	-0.0967	0.109	-0.00726	0.0467
	(0.0858)	(0.0957)	(0.109)	(0.115)	(0.124)	(0.130)	(0.130)	(0.138)
2.size#Belgium#MP Shock	-0.000523	0.0115	0.0466*	-0.00765	-0.0174	-0.0617*	0.000853	-0.0636*
	(0.0180)	(0.0198)	(0.0218)	(0.0230)	(0.0243)	(0.0252)	(0.0261)	(0.0270)
2.size#Germany#MP Shock	-0.0156	-0.00763	-0.0432*	-0.0335	-0.0468*	-0.0646**	-0.0603**	-0.0973***
	(0.0141)	(0.0155)	(0.0175)	(0.0184)	(0.0194)	(0.0203)	(0.0210)	(0.0218)
2.size#Spain#MP Shock	-0.0127	0.0394	0.00508	-0.0403	-0.0228	-0.00572	-0.0164	-0.0271
	(0.0231)	(0.0255)	(0.0283)	(0.0293)	(0.0313)	(0.0327)	(0.0335)	(0.0350)
2.size#Italy#MP Shock	0.0238	0.0497	0.0311	0.0266	-0.0308	-0.0443	0.0160	-0.000371
	(0.0244)	(0.0271)	(0.0301)	(0.0314)	(0.0329)	(0.0349)	(0.0356)	(0.0367)
2.size#Netherlands#MP Shock	0.0631	0.0793*	0.0458	-0.0292	-0.0452	-0.0688	-0.0260	-0.0825
	(0.0357)	(0.0391)	(0.0433)	(0.0458)	(0.0484)	(0.0499)	(0.0519)	(0.0540)
2.size#Portugal#MP Shock	-0.0706	0.0879	-0.0746	0.0527	-0.00313	-0.0380	-0.0382	-0.0992
	(0.0415)	(0.0451)	(0.0494)	(0.0520)	(0.0540)	(0.0569)	(0.0587)	(0.0609)
3.size#Belgium#MP Shock	0.0291**	-0.00446	0.0325**	-0.0108	-0.0543***	-0.0653***	-0.0676***	-0.0790***
	(0.0106)	(0.0115)	(0.0125)	(0.0132)	(0.0139)	(0.0144)	(0.0149)	(0.0154)
3.size#Germany#MP Shock	-0.0424***	-0.0468***	-0.0724***	-0.0872***	-0.124***	-0.180***	-0.182***	-0.219***
	(0.00853)	(0.00936)	(0.0101)	(0.0106)	(0.0113)	(0.0118)	(0.0122)	(0.0126)
3.size#Spain#MP Shock	-0.00966	-0.0240	-0.0122	-0.0491***	-0.0859***	-0.0750***	-0.0917***	-0.147***
	(0.0114)	(0.0125)	(0.0135)	(0.0142)	(0.0151)	(0.0158)	(0.0163)	(0.0169)
3.size#Italy#MP Shock	-0.0224*	-0.0151	-0.0562***	-0.0823***	-0.110***	-0.135***	-0.136***	-0.202***
	(0.0104)	(0.0114)	(0.0124)	(0.0130)	(0.0138)	(0.0145)	(0.0148)	(0.0153)
3.size#Netherlands#MP Shock	-0.0337	-0.0228	-0.0241	-0.0335	-0.0661*	-0.0828**	-0.119***	-0.160***
	(0.0196)	(0.0214)	(0.0233)	(0.0245)	(0.0262)	(0.0272)	(0.0282)	(0.0293)
3.size#Portugal#MP Shock	-0.0106	-0.00966	-0.0203	-0.0722**	0.00156	0.0121	-0.0684*	-0.0673*
	(0.0212)	(0.0231)	(0.0252)	(0.0266)	(0.0281)	(0.0295)	(0.0304)	(0.0315)
0.size#HHI#MP Shock	-0.359	-3.242*	-2.439	-0.139	0.488	2.569	0.587	-1.040
	(1.195)	(1.307)	(1.471)	(1.550)	(1.659)	(1.740)	(1.802)	(1.856)
1.size#HHI#MP Shock	-1.608**	-1.084	-1.656*	-0.500	0.356	-0.348	-0.0572	-2.082*
	(0.580)	(0.622)	(0.716)	(0.756)	(0.780)	(0.822)	(0.839)	(0.866)
2.size#HHI#MP Shock	0.00141	-0.419	-0.784	0.106	0.473	0.221	-0.485	-0.639
	(0.351)	(0.382)	(0.425)	(0.446)	(0.472)	(0.490)	(0.505)	(0.527)
3.size#HHI#MP Shock	-0.172	-0.227	-0.691**	-0.630**	-0.175	-0.625*	-0.199	-0.244
	(0.183)	(0.201)	(0.215)	(0.228)	(0.243)	(0.251)	(0.261)	(0.269)
N	2224293	2139794	2062358	1994846	1926826	1863944	1807759	1765453
adj. R^2	0.174	0.165	0.163	0.160	0.158	0.155	0.157	0.163

Notes: Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.
The table presents detailed results for the baseline specification in monthly frequencies, including country-MP interactions and the HHI variable from Amadeus.

Table C9: Detailed results for HHI 2/2

	F9price_change	F10price_change	F11price_change	F12price_change	F13price_change	F14price_change	F15price_change	F16price_change
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.price_change	-0.561***	-0.561***	-0.546***	-0.501***	-0.523***	-0.537***	-0.552***	-0.559***
	(0.00107)	(0.00110)	(0.00114)	(0.00119)	(0.00126)	(0.00131)	(0.00136)	(0.00141)
L2.price_change	-0.319***	-0.304***	-0.249***	-0.250***	-0.273***	-0.292***	-0.304***	-0.318***
	(0.00118)	(0.00122)	(0.00126)	(0.00131)	(0.00139)	(0.00145)	(0.00150)	(0.00155)
L3.price_change	-0.173***	-0.121***	-0.115***	-0.125***	-0.146***	-0.160***	-0.174***	-0.179***
	(0.00118)	(0.00122)	(0.00126)	(0.00130)	(0.00138)	(0.00144)	(0.00150)	(0.00155)
L4.price_change	-0.0489***	-0.0415***	-0.0440***	-0.0554***	-0.0673***	-0.0789***	-0.0825***	-0.0884***
	(0.00106)	(0.00110)	(0.00113)	(0.00117)	(0.00124)	(0.00130)	(0.00135)	(0.00139)
0.size#Belgium#MP Shock	0.504***	0.167	0.468**	0.114	0.314	0.348	0.454*	0.191
	(0.147)	(0.154)	(0.164)	(0.165)	(0.170)	(0.181)	(0.190)	(0.191)
0.size#Germany#MP Shock	-0.0479	-0.0277	0.242	0.186	-0.0799	-0.112	-0.184	0.461**
	(0.130)	(0.136)	(0.140)	(0.145)	(0.154)	(0.160)	(0.168)	(0.168)
0.size#Spain#MP Shock	0.144	0.266	0.261	0.0419	-0.175	0.0891	0.320	0.145
	(0.148)	(0.152)	(0.160)	(0.157)	(0.172)	(0.177)	(0.184)	(0.192)
0.size#Italy#MP Shock	-0.206	-0.282	0.695**	-0.212	-0.303	0.197	-0.222	0.405
	(0.217)	(0.224)	(0.232)	(0.240)	(0.248)	(0.275)	(0.281)	(0.279)
0.size#Netherlands#MP Shock	0.196	0.535*	0.276	-0.205	0.0379	0.375	0.733*	-0.264
	(0.245)	(0.247)	(0.259)	(0.265)	(0.273)	(0.289)	(0.308)	(0.309)
0.size#Portugal#MP Shock	-0.130	0.162	0.377	-0.0494	-0.192	0.102	-0.262	0.000805
	(0.215)	(0.217)	(0.242)	(0.239)	(0.252)	(0.264)	(0.270)	(0.268)
1.size#Belgium#MP Shock	0.0127	0.0196	0.0676	0.0552	0.129*	0.0752	0.0935	0.0184
	(0.0516)	(0.0528)	(0.0562)	(0.0571)	(0.0603)	(0.0629)	(0.0688)	(0.0701)
1.size#Germany#MP Shock	0.0877	-0.00218	0.129*	-0.0260	-0.0804	-0.00391	-0.0241	-0.0646
	(0.0506)	(0.0517)	(0.0554)	(0.0555)	(0.0583)	(0.0611)	(0.0646)	(0.0665)
1.size#Spain#MP Shock	0.0716	0.0409	0.111	-0.0439	-0.000887	0.0154	-0.0250	-0.0507
	(0.0725)	(0.0758)	(0.0774)	(0.0804)	(0.0847)	(0.0892)	(0.0944)	(0.0923)
1.size#Italy#MP Shock	0.00221	0.160	0.358***	0.170	0.118	0.222	0.246	0.111
	(0.0970)	(0.102)	(0.106)	(0.110)	(0.112)	(0.120)	(0.129)	(0.128)
1.size#Netherlands#MP Shock	0.0809	-0.0978	0.211	-0.0611	-0.0607	0.139	-0.0756	-0.238
	(0.117)	(0.117)	(0.132)	(0.130)	(0.139)	(0.149)	(0.150)	(0.158)
1.size#Portugal#MP Shock	0.0389	-0.105	0.267	0.0180	0.00410	0.0283	-0.0526	0.159
	(0.143)	(0.145)	(0.149)	(0.155)	(0.160)	(0.165)	(0.178)	(0.178)
2.size#Belgium#MP Shock	-0.00748	-0.0609*	-0.0748*	-0.0745*	-0.118***	-0.0864*	-0.0830*	-0.151***
	(0.0280)	(0.0287)	(0.0298)	(0.0306)	(0.0319)	(0.0336)	(0.0351)	(0.0357)
2.size#Germany#MP Shock	-0.0887***	-0.0866***	-0.142***	-0.149***	-0.146***	-0.145***	-0.197***	-0.249***
	(0.0226)	(0.0232)	(0.0239)	(0.0246)	(0.0257)	(0.0271)	(0.0284)	(0.0286)
2.size#Spain#MP Shock	-0.0270	-0.0474	-0.0895*	-0.0695	-0.0836*	-0.0756	-0.101*	-0.188***
	(0.0361)	(0.0375)	(0.0386)	(0.0394)	(0.0410)	(0.0430)	(0.0451)	(0.0454)
2.size#Italy#MP Shock	-0.0421	0.0218	-0.0273	-0.157***	-0.125**	-0.0788	-0.0778	-0.116*
	(0.0378)	(0.0399)	(0.0406)	(0.0410)	(0.0431)	(0.0458)	(0.0486)	(0.0490)
2.size#Netherlands#MP Shock	0.0549	-0.0282	-0.0483	-0.0553	-0.0856	-0.109	-0.0305	-0.177*
	(0.0563)	(0.0576)	(0.0600)	(0.0618)	(0.0643)	(0.0682)	(0.0720)	(0.0729)
2.size#Portugal#MP Shock	-0.0922	-0.0892	0.0328	-0.233***	-0.204**	-0.211**	-0.248**	-0.267***
	(0.0626)	(0.0640)	(0.0653)	(0.0656)	(0.0694)	(0.0723)	(0.0758)	(0.0768)
3.size#Belgium#MP Shock	-0.0975***	-0.110***	-0.142***	-0.155***	-0.163***	-0.161***	-0.175***	-0.178***
	(0.0159)	(0.0162)	(0.0168)	(0.0172)	(0.0179)	(0.0186)	(0.0194)	(0.0198)
3.size#Germany#MP Shock	-0.240***	-0.233***	-0.273***	-0.283***	-0.287***	-0.283***	-0.264***	-0.298***
	(0.0129)	(0.0133)	(0.0137)	(0.0140)	(0.0147)	(0.0153)	(0.0159)	(0.0162)
3.size#Spain#MP Shock	-0.145***	-0.145***	-0.186***	-0.192***	-0.176***	-0.207***	-0.210***	-0.210***
	(0.0173)	(0.0180)	(0.0185)	(0.0190)	(0.0197)	(0.0207)	(0.0216)	(0.0219)
3.size#Italy#MP Shock	-0.177***	-0.192***	-0.209***	-0.203***	-0.227***	-0.212***	-0.194***	-0.248***
	(0.0158)	(0.0164)	(0.0167)	(0.0170)	(0.0178)	(0.0186)	(0.0194)	(0.0197)
3.size#Netherlands#MP Shock	-0.130***	-0.179***	-0.164***	-0.203***	-0.220***	-0.201***	-0.211***	-0.165***
	(0.0303)	(0.0313)	(0.0321)	(0.0330)	(0.0344)	(0.0360)	(0.0379)	(0.0386)
3.size#Portugal#MP Shock	-0.131***	-0.0777*	-0.115***	-0.127***	-0.132***	-0.158***	-0.0838*	-0.162***
	(0.0323)	(0.0333)	(0.0344)	(0.0353)	(0.0370)	(0.0383)	(0.0399)	(0.0405)
0.size#HHI#MP Shock	-4.044*	1.064	-1.102	2.148	1.484	-0.829	0.0106	0.324
	(1.955)	(2.058)	(2.181)	(2.152)	(2.218)	(2.418)	(2.501)	(2.574)
1.size#HHI#MP Shock	-1.220	-1.403	-3.450***	-2.052*	-1.811	-3.175**	-1.987	-2.080
	(0.894)	(0.918)	(0.949)	(0.987)	(1.041)	(1.081)	(1.181)	(1.149)
2.size#HHI#MP Shock	-0.743	0.498	-0.581	1.273*	1.252*	0.115	0.672	2.297***
	(0.546)	(0.564)	(0.571)	(0.592)	(0.617)	(0.647)	(0.689)	(0.691)
3.size#HHI#MP Shock	-0.231	-0.113	-0.327	0.175	0.363	0.274	0.582	-0.298
	(0.277)	(0.285)	(0.293)	(0.301)	(0.313)	(0.327)	(0.348)	(0.355)
N	1717516	1667417	1615358	1562132	1502357	1452685	1408922	1370210
adj. R^2	0.164	0.161	0.153	0.135	0.139	0.142	0.145	0.147

Notes: Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.
The table presents detailed results for the baseline specification in monthly frequencies, including country-MP interactions and the HHI variable from Amadeus.

Appendix D Monetary Policy and Aggregate Trade Unit Values

I use the yearly trade unit values database that is produced by the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). The database I use from CEPII offers several advantages. It provides bilateral trade unit values calculated at a highly granular level, which are then aggregated into Harmonized System 6-digit categories. This ensures greater cross-country comparability and improves the precision of trade price distinctions within product categories, compared to other global datasets. Additionally, an econometric analysis of the dataset in Berthou and Emlinger (2011) shows that its unit values are closely related to key economic indicators, further demonstrating its robustness.

In the dataset there are more than 5000 product codes following the "8-digit Combined Nomenclature" that is standard in the customs data. I keep only the unit trade values associated to the trade flows that are related to the Euro area initial members: Austria, Belgium, Germany, Spain, Italy, France, Netherlands and Portugal. Therefore, I use the yearly trade unit value of each reporter-partner-product relationship. Given that my interest is on the dynamic price discrimination, I focus only to the exports since they are "Free on board" and do not include transportation costs.

Before implementing my chosen empirical specification, I transform the values from USD dollars to Euro by using the exchange rate in each period. Then I use different cleaning procedures to ensure that the results are consistent. I use my specification without cleaning or by dropping the product codes where there are consistently big changes. More specifically, in two different setups, I drop the product codes where more than 20% of the cases have a 200% increase of their unit values or a -66% decrease. Although, we expect a higher variation in the trade unit values, I proceed to these setups to focus on the more homogeneous product codes.

D.1 Specification

I use panel local projections as in Jordà (2005), and I use as a dependent variable the cumulative percentage change of the unit value:

$$\frac{UV_{p,os,cs,t+1} - UV_{p,oc,ds,t-1}}{UV_{p,oc,ds,t-1}} = fC + fI + \epsilon_t^M + \beta_h Conc_{ds,t-2}\epsilon_t^m + \sum_{l=1}^{L} X_{t-l} + u_{p,cs,t+h}$$

The dependent variable is the cumulative percentage change of the trade unit value for the product p, from the origin country sector oc to the destination country sector ds one year after the monetary policy shock. I include fixed effects related to the country origin, country destination and product. Moreover, I include four lags of the cumulative change of the trade unit before the shock. Finally, I use the concentration or productivity distribution variables that were described before with the addition that I include also the values for the French market.

Although this is the baseline estimation and I account for th fixed effects of the origin, destination and product, I also proceed to two additional estimation by including the interaction of country dummies and monetary policy shock or the interaction of industry dummies and monetary policy shock. In this way, I can account for the dynamic country or sector[20] specific effects of the shock.

By including the country interactions, the specification changes to :

$$\frac{UV_{p,os,cs,t+1} - UV_{p,oc,ds,t-1}}{UV_{p,oc,ds,t-1}} = fC + fI + \mathbf{I}[b \in C]\epsilon_t^m + \beta_h Conc_{ds,t-2}\epsilon_t^m + \sum_{l=1}^{L} X_{t-l} + u_{p,cs,t+h}$$

Where $\mathbf{I}[b \in C]$ is the country dummy taking the value 1 if the destination country is C

By including the sector interactions, the specification changes to :

$$\frac{UV_{p,os,cs,t+1} - UV_{p,oc,ds,t-1}}{UV_{p,oc,ds,t-1}} = fC + fI + \mathbf{I}[p \in S]\epsilon_t^m + \beta_h Conc_{ds,t-2}\epsilon_t^m + \sum_{l=1}^{L} X_{t-l} + u_{p,cs,t+h}$$

Where $\mathbf{I}[b \in S]$ is the sector dummy taking the value 1 if the sector of the product is S.

In general, in all the cases, cleaning or not, the results are consistent with the exceptions of few cases related to time-invariant productivity distribution variables.

D.2 No cleaning

The first results are related to the empirical analysis without proceeding to cleaning.

D.3 Cleaning

In this section, I proceed to various types of cleaning, focusing on eliminating product codes that have too many cases of extremely varying unit values. I count the cases where the cumulative percentage change of the price is 200% or -66%. Then I proceed to three setups, the first one is to drop all the product codes that have more than 25% of their observations with extreme changes of the prices. Then I proceed to 15% and 10%.

[20]By looking at all the billateral trade flows in the Euro area I include a higher variation that allows to include the sector specific dynamic effects without capturing the most part of the variation of the concentration or productivity measures.

	UV change								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
HHI Rev #MP Shock	-2.131***	-3.602***	-1.698***						
	(0.518)	(0.572)	(0.615)						
HHI Rev #Inf Shock	1.174***	-1.431***	1.598***						
	(0.441)	(0.497)	(0.507)						
MP Shock	-0.779***			-1.721***			-1.569***		
	(0.0258)			(0.0754)			(0.0878)		
Inf Shock	-1.408***			-1.979***			-2.162***		
	(0.0263)			(0.0770)			(0.0938)		
TFP Shape (Amadeus)#MP Shock				0.0749***	0.0973***	-0.0139			
				(0.0243)	(0.0261)	(0.0310)			
TFP Scale (Amadeus)#MP Shock				-0.000301**	-0.000218	-0.000876			
				(0.000131)	(0.000134)	(0.000625)			
TFP Shape (Amadeus)#Inf Shock				0.0253	0.0362	-0.000818			
				(0.0246)	(0.0264)	(0.0324)			
TFP Scale (Amadeus)#Inf Shock				-0.000824***	-0.000757***	-0.000972			
				(0.000138)	(0.000140)	(0.000647)			
TFP Shape (Compnet)#MP Shock							0.454***	0.229***	0.402***
							(0.0471)	(0.0626)	(0.0539)
TFP Scale (Compnet)#MP Shock							-0.135***	-0.0625***	-0.174***
							(0.0112)	(0.0198)	(0.0122)
TFP Shape (Compnet)#Inf Shock							0.379***	0.275***	0.521***
							(0.0505)	(0.0667)	(0.0578)
TFP Scale (Compnet)#Inf Shock							-0.0877***	-0.0749***	-0.107***
							(0.0117)	(0.0205)	(0.0126)
Observations	1,089,366	1,089,366	1,089,366	1,063,928	1,063,928	1,063,928	757,847	757,847	757,847
R-squared	0.047	0.048	0.047	0.050	0.050	0.050	0.053	0.054	0.054
Country Interactions	No	Yes	No	No	Yes	No	No	Yes	No
Industry Interactions	No	No	Yes	No	No	Yes	No	No	Yes

Notes: Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.
The table presents results on the role of concentration and productivity distribution in the impact of monetary policy on changes in trade unit values. No data-cleaning procedures were applied.

Table D1: Caption

	(1)
VARIABLES	Fuv_change
MP Shock	-1.614***
	(0.0226)
Inf Shock	-2.077***
	(0.0246)
Periphery# MP Shock	0.136***
	(0.0369)
Periphery# Inf Shock	0.160***
	(0.0386)
Observations	1,355,439
R-squared	0.049

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.
The table presents the differential impact of monetary policy on the trade unit value changes in Core and Periphery. No data-cleaning procedures were applied.

In all cleaning procedures, the results consistently show a strong and negative coefficient for the HHI and monetary policy shock, indicating that trade unit values decrease more significantly in highly concentrated country-sectors. Additionally, both the time-variant Pareto shape parameter (CompNet) and the time-invariant Pareto shape parameter (Amadeus) are positive and significant across the majority of specifications and data setups. This suggests that trade unit values decrease more in distributions characterized by a higher share of highly productive firms (i.e., lower Pareto shape parameter).

	UV change								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
HHI Rev#c.MP Shock	-2.287***	-3.509***	-1.865***						
	(0.495)	(0.544)	(0.588)						
HHI Rev#Inf Shock	1.379***	-0.999**	1.745***						
	(0.409)	(0.459)	(0.470)						
MP Shock	-0.729***			-1.620***			-1.521***		
	(0.0246)			(0.0727)			(0.0827)		
Infsum	-1.344***			-1.810***			-1.970***		
	(0.0252)			(0.0743)			(0.0889)		
TFP Shape (Amadeus)#c.MP Shock				0.0568**	0.0792***	-0.00729			
				(0.0237)	(0.0255)	(0.0310)			
TFP Scale (Amadeus)#c.MP Shock				-0.000201	-0.000114	-0.000741			
				(0.000125)	(0.000128)	(0.000608)			
TFP Shape (Amadeus)#Inf Shock				-0.00701	0.00499	-0.00709			
				(0.0241)	(0.0258)	(0.0324)			
TFP Scale (Amadeus)#Inf Shock				-0.000789***	-0.000714***	-0.00136**			
				(0.000132)	(0.000135)	(0.000631)			
TFP Shape (Compnet)#c.MP Shock							0.447***	0.207***	0.413***
							(0.0447)	(0.0592)	(0.0510)
TFP Scale (Compnet)#c.MP Shock							-0.128***	-0.0463**	-0.168***
							(0.0106)	(0.0187)	(0.0118)
TFP Shape (Compnet)#Inf Shock							0.314***	0.199***	0.456***
							(0.0477)	(0.0630)	(0.0547)
TFP Scale (Compnet)#Inf Shock							-0.0889***	-0.0668***	-0.107***
							(0.0110)	(0.0196)	(0.0121)
Observations	946,220	946,220	946,220	931,755	931,755	931,755	659,220	659,220	659,220
R-squared	0.042	0.044	0.042	0.046	0.046	0.046	0.049	0.051	0.050
Country Interactions	No	Yes	No	No	Yes	No	No	Yes	No
Industry Interactions	No	No	Yes	No	No	Yes	No	No	Yes

Notes: Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.
The table presents results on the role of concentration and productivity distribution in the impact of monetary policy on changes in trade unit values. I drop product codes for which at least 20% of the observations contain extreme changes.

	UV change								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
HHI Rev#MP Shock	-3.472***	-4.211***	-2.879***						
	(0.520)	(0.568)	(0.617)						
HHI Rev#Inf Shock	0.562	-1.425***	0.315						
	(0.428)	(0.469)	(0.493)						
MP Shock	-0.605***			-1.739***			-1.319***		
	(0.0263)			(0.0732)			(0.0867)		
Inf Shock	-1.133***			-1.874***			-1.610***		
	(0.0267)			(0.0773)			(0.0948)		
TFP Shape (Amadeus)#MP Shock				0.112***	0.131***	0.0524*			
				(0.0238)	(0.0253)	(0.0314)			
TFP Min (Amadeus)#MP Shock				0.00039***	0.00044***	0.00011			
				(0.000136)	(0.000138)	(0.000652)			
TFP Shape (Amadeus)#Inf Shock				0.0656***	0.0809***	0.0608*			
				(0.0249)	(0.0267)	(0.0331)			
TFP Min (Amadeus)#Inf Shock				-0.00018	-0.00013	-0.00005			
				(0.000146)	(0.000147)	(0.000670)			
TFP Shape (Compnet)#MP Shock							0.396***	0.158**	0.317***
							(0.0461)	(0.0622)	(0.0527)
TFP Min (Compnet)#MP Shock							-0.122***	-0.0441**	-0.153***
							(0.0119)	(0.0204)	(0.0132)
TFP Shape (Compnet)#Inf Shock							0.242***	0.120*	0.326***
							(0.0503)	(0.0687)	(0.0570)
TFP Min (Compnet)#Inf Shock							-0.0968***	-0.0708***	-0.107***
							(0.0127)	(0.0214)	(0.0140)
Observations	477,888	477,888	477,888	475,614	475,614	475,614	332,551	332,551	332,551
R-squared	0.042	0.045	0.043	0.049	0.049	0.050	0.051	0.053	0.053
Country Interactions	No	Yes	No	No	Yes	No	No	Yes	No
Industry Interactions	No	No	Yes	No	No	Yes	No	No	Yes

Table D2: Cumulative Unit Value Change

Notes: The table displays the values of the coefficients related to the interaction of the destinations' firms distribution variables and monetary policy shocks. I drop the product codes where at least 15% of the observations are related to extreme changes.

Table D3: Caption

	UV change								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
HHI Rev#c.MP Shock	-5.610***	-5.704***	-6.782***						
	(0.919)	(0.999)	(1.092)						
HHI Rev#Inf Shock	-1.530*	-3.241***	-1.952**						
	(0.860)	(0.929)	(0.987)						
MP Shock	-0.430***			-1.525***			-1.100***		
	(0.0449)			(0.114)			(0.155)		
Infsum	-0.970***			-1.767***			-1.474***		
	(0.0470)			(0.132)			(0.176)		
TFP Shape (Amadeus)#c.MP Shock				0.0965***	0.119***	0.0614			
				(0.0358)	(0.0384)	(0.0523)			
TFP Scale (Amadeus)#c.MP Shock				-2.29e-05	3.29e-05	0.000975			
				(0.000220)	(0.000223)	(0.000988)			
TFP Shape (Amadeus)#Inf Shock				0.0690*	0.0934**	0.0818			
				(0.0415)	(0.0443)	(0.0597)			
TFP Scale (Amadeus)#Inf Shock				-6.98e-05	3.23e-05	0.00145			
				(0.000248)	(0.000253)	(0.00107)			
TFP Shape (Compnet)#c.MP Shock							0.310***	-0.0978	0.238***
							(0.0795)	(0.109)	(0.0877)
TFP Scale (Compnet)#c.MP Shock							-0.120***	0.0150	-0.156***
							(0.0191)	(0.0331)	(0.0214)
TFP Shape (Compnet)#Inf Shock							0.194**	-0.131	0.211**
							(0.0903)	(0.129)	(0.0970)
TFP Scale (Compnet)#Inf Shock							-0.0822***	0.0359	-0.0841***
							(0.0198)	(0.0346)	(0.0224)
Observations	107,930	107,930	107,930	107,749	107,749	107,749	74,404	74,404	74,404
R-squared	0.050	0.054	0.051	0.062	0.062	0.064	0.066	0.069	0.069
Country Interactions	No	Yes	No	No	Yes	No	No	Yes	No
Industry Interactions	No	No	Yes	No	No	Yes	No	No	Yes

Notes: Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.
The table presents results on the role of concentration and productivity distribution in the impact of monetary policy on changes in trade unit values. I drop product codes for which at least 10% of the observations contain extreme changes.

Appendix E Heterogeneous Selection Effect

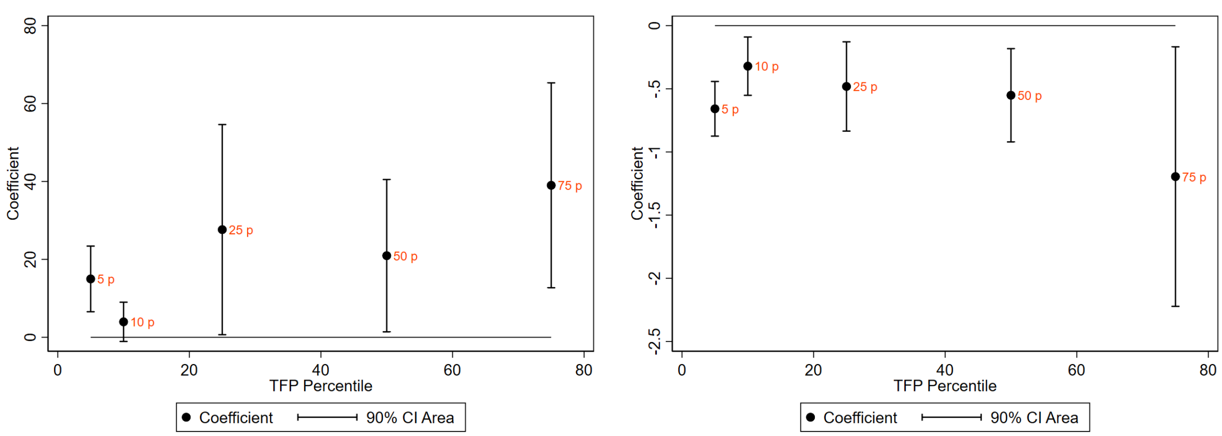
I use the time-variant data related to the productivity in each country-sector in the Euro area from the CompNet database. The summary of the data can be found in Appendix A. The goal is to identify the movement of productivity in the lower percentiles of the productivity distribution depending on concentration or shape of the distribution. In this way, I focus on the potential selection mechanism in each country-sector trying to investigate the domestic dynamics.

I use as dependent variable the absolute or percentage change of TFP in the low and medium percentiles of the distribution. As before, I use three specifications. In the first one I include only the interaction of the country-sector concentration or shape of productivity distribution with the monetary policy shock. In the next two, I include the interaction of country or sector specific dummy with the monetary policy shocks.

The data are in annual frequencies and I use the aggregate monetary policy and information shocks.

E.1 Results

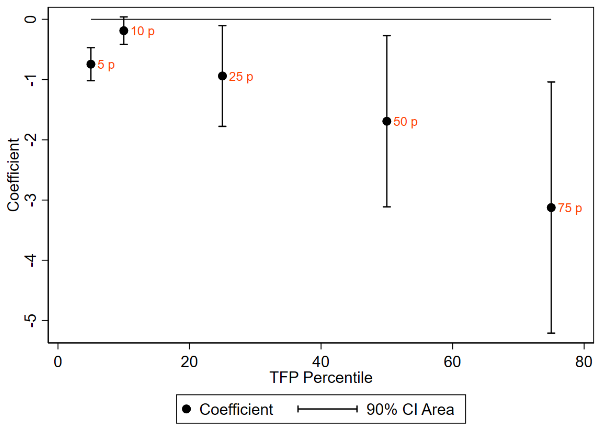
E.1.1 Baseline



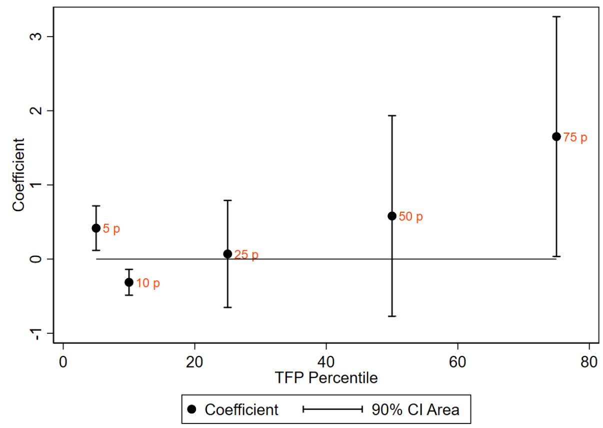
(A.) HHI Revenue **(B.)** TFP Shape (Amadeus)

Figure E1: Heterogeneous Selection Mechanism

Notes: The table presents the coefficients for the interaction between concentration or productivity distribution variables and monetary policy shocks across various percentiles of the TFP distribution. The TFP values are expressed in absolute terms.



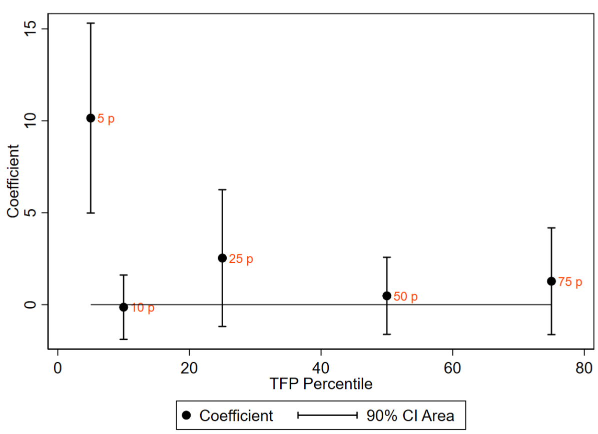
(A.) TFP Shape (CompNet)



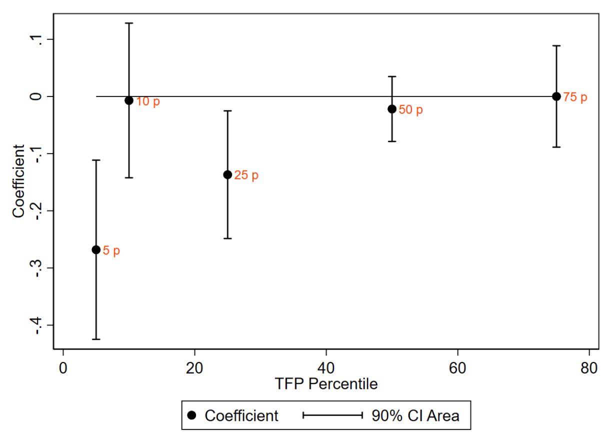
(B.) TFP Skewness (CompNet)

Figure E2: Heterogeneous Selection Mechanism

Notes: The table presents the coefficients for the interaction between concentration or productivity distribution variables and monetary policy shocks across various percentiles of the TFP distribution. The TFP values are expressed in absolute terms.



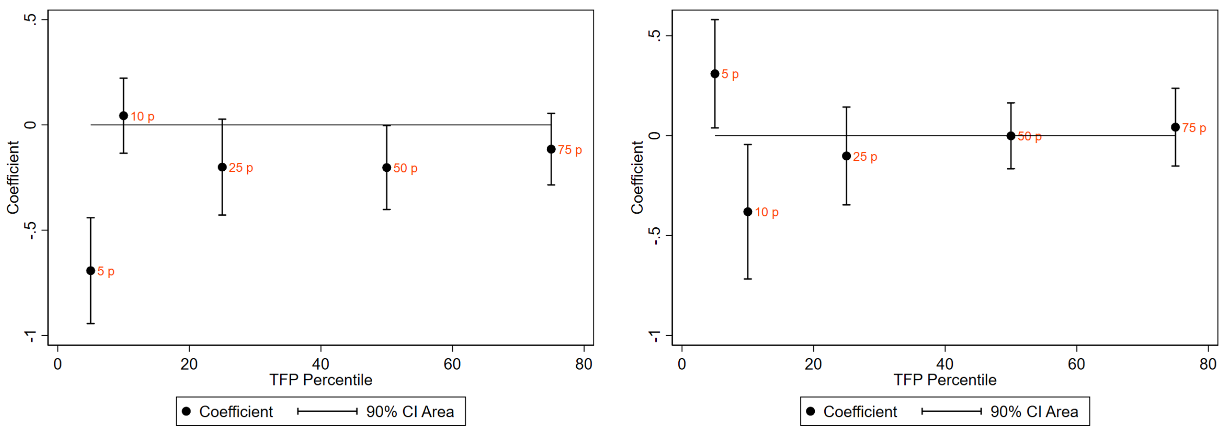
(A.) HHI Revenue



(B.) TFP Shape (Amadeus)

Figure E3: Heterogeneous Selection Mechanism (Rate)

Notes: The table presents the coefficients for the interaction between concentration or productivity distribution variables and monetary policy shocks across various percentiles of the TFP distribution. The TFP values are expressed in cumulative change rates.



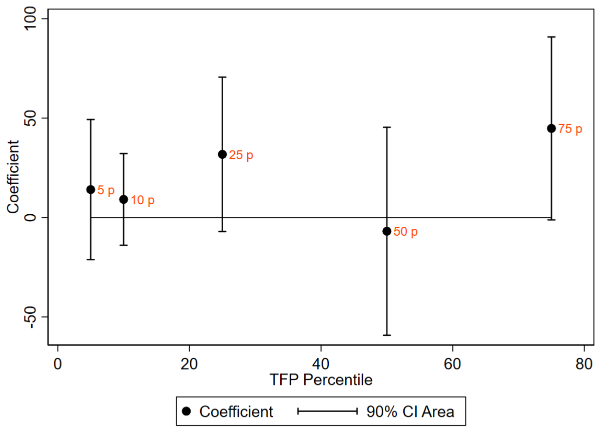
(A.) TFP Shape (CompNet)

(B.) TFP Skewness (CompNet)

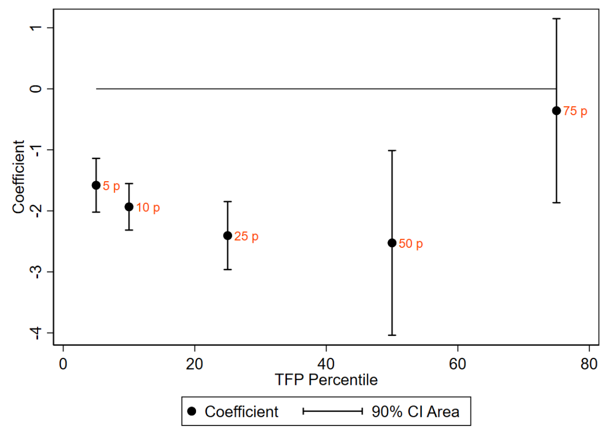
Figure E4: Heterogeneous Selection Mechanism (Rate)

Notes: The table presents the coefficients for the interaction between concentration or productivity distribution variables and monetary policy shocks across various percentiles of the TFP distribution. The TFP values are expressed in cumulative change rate.

E.1.2 Industry Interactions



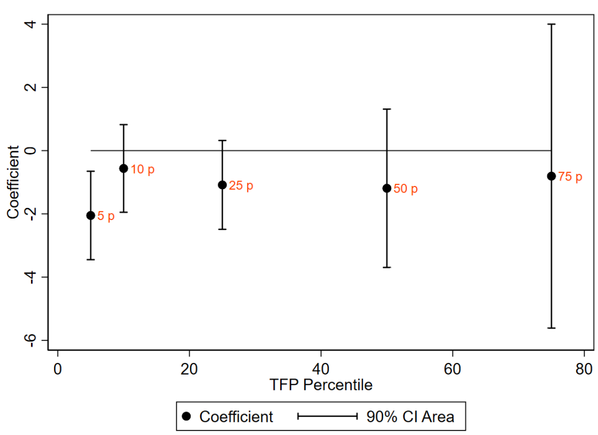
(A.) HHI Revenue



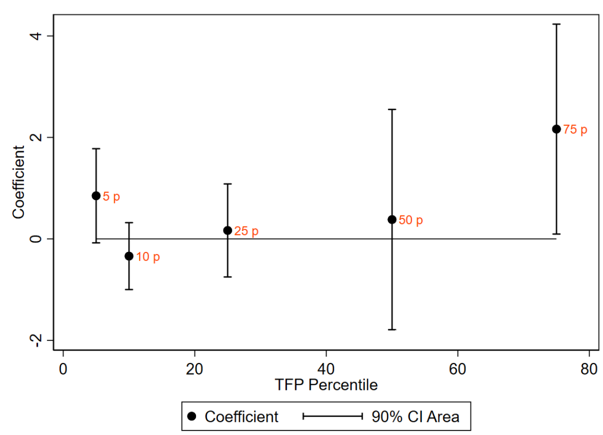
(B.) TFP Shape (Amadeus)

Figure E5: Heterogeneous Selection Mechanism

Notes: The table presents the coefficients for the interaction between concentration or productivity distribution variables and monetary policy shocks across various percentiles of the TFP distribution. The TFP values are expressed in absolute terms.



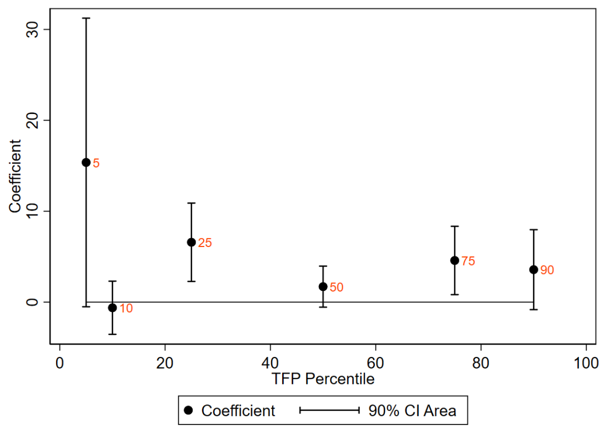
(A.) TFP Shape (CompNet)



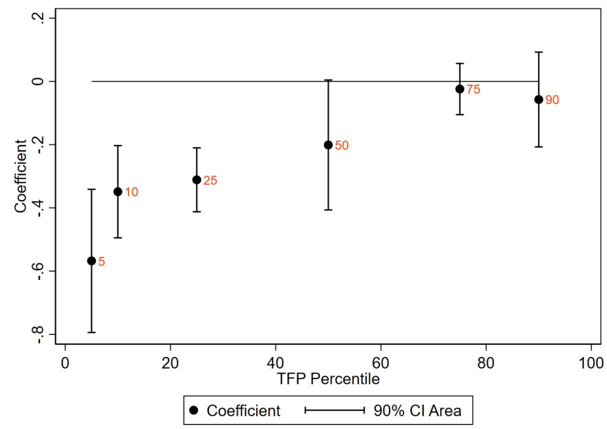
(B.) TFP Skewness (CompNet)

Figure E6: Heterogeneous Selection Mechanism

Notes: The table presents the coefficients for the interaction between concentration or productivity distribution variables and monetary policy shocks across various percentiles of the TFP distribution. The TFP values are expressed in cumulative change rates.



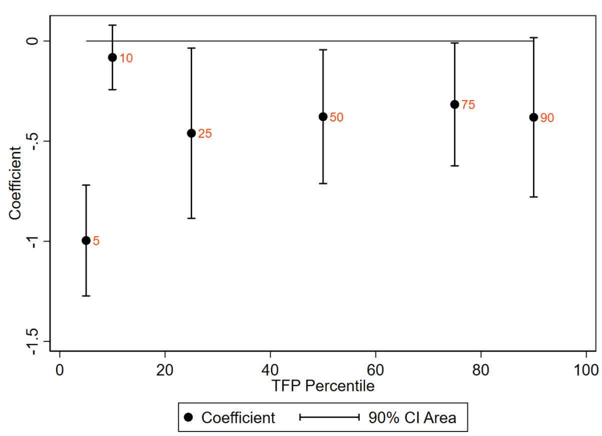
(A.) HHI Revenue



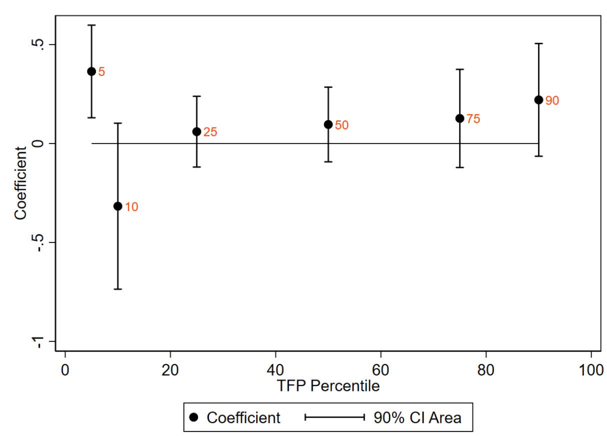
(B.) TFP Shape (Amadeus)

Figure E7: Heterogeneous Selection Mechanism (Rate)

Notes: The table presents the coefficients for the interaction between concentration or productivity distribution variables and monetary policy shocks across various percentiles of the TFP distribution. The TFP values are expressed in cumulative change rates.



(A.) TFP Shape (CompNet)

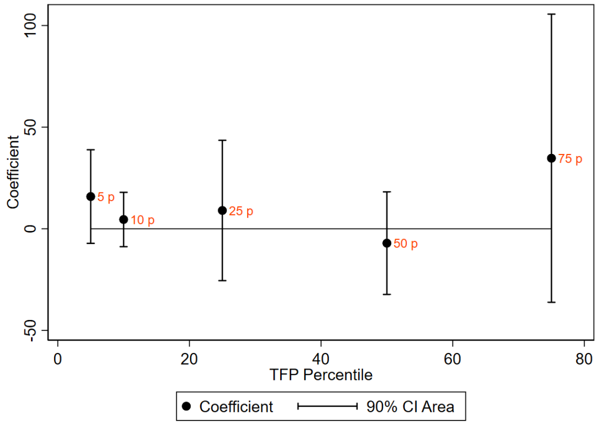


(B.) TFP Skewness (CompNet)

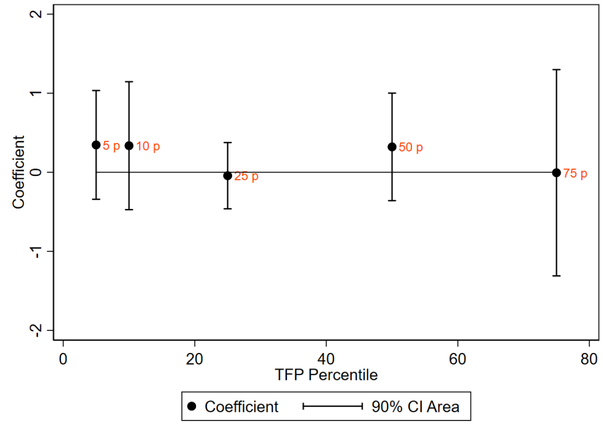
Figure E8: Heterogeneous Selection Mechanism (Rate)

Notes: The table presents the coefficients for the interaction between concentration or productivity distribution variables and monetary policy shocks across various percentiles of the TFP distribution. The TFP values are expressed in cumulative change rates.

E.1.3 Country Interactions



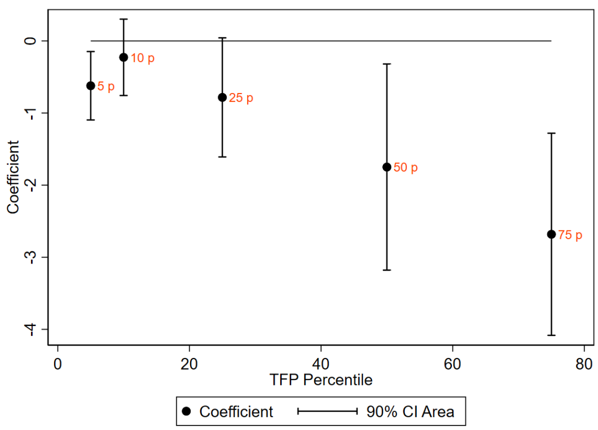
(A.) HHI Revenue



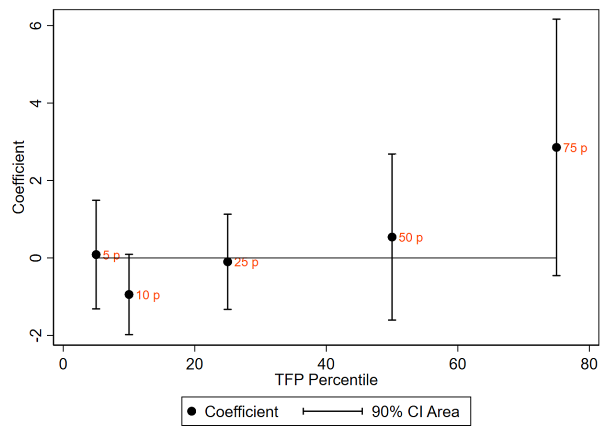
(B.) TFP Shape (Amadeus)

Figure E9: Heterogeneous Selection Mechanism

Notes: The table presents the coefficients for the interaction between concentration or productivity distribution variables and monetary policy shocks across various percentiles of the TFP distribution. The TFP values are expressed in absolute terms.



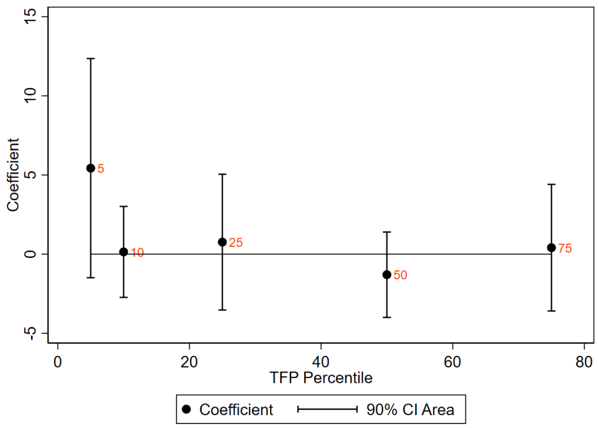
(A.) TFP Shape (CompNet)



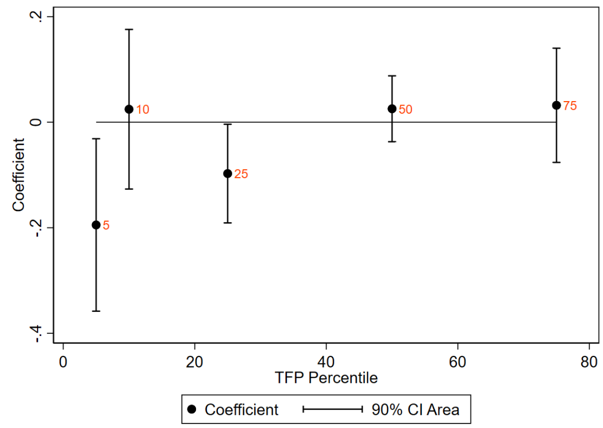
(B.) TFP Skewness (CompNet)

Figure E10: Heterogeneous Selection Mechanism

Notes: The table presents the coefficients for the interaction between concentration or productivity distribution variables and monetary policy shocks across various percentiles of the TFP distribution. The TFP values are expressed in absolute terms.



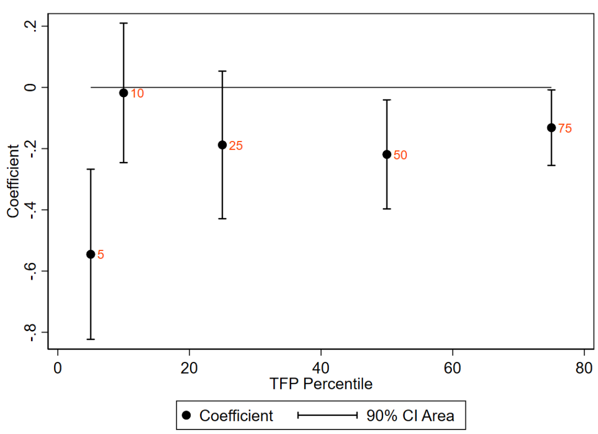
(A.) HHI Revenue



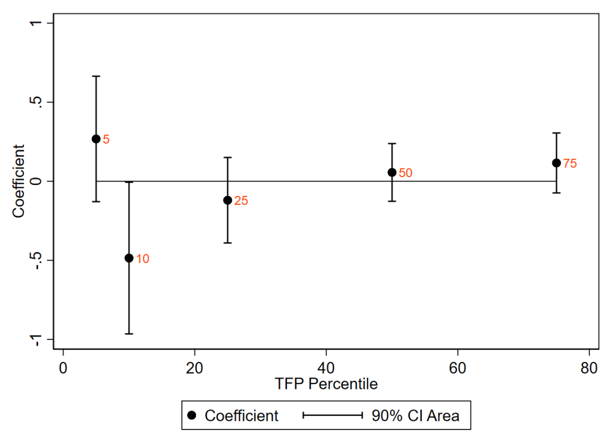
(B.) TFP Shape (Amadeus)

Figure E11: Heterogeneous Selection Mechanism (Rate)

Notes: The table presents the coefficients for the interaction between concentration or productivity distribution variables and monetary policy shocks across various percentiles of the TFP distribution. The TFP values are expressed in cumulative change rates.



(A.) TFP Shape (CompNet)



(B.) TFP Skewness (CompNet)

Figure E12: Heterogeneous Selection Mechanism (Rate)

Notes: The table presents the coefficients for the interaction between concentration or productivity distribution variables and monetary policy shocks across various percentiles of the TFP distribution. The TFP values are expressed in cumulative change rates.

Appendix F Two-country model

F.1 Households Problem

The household's problem is summarized as the choice of the set $\{q_i^c, N_t, B_t\}$ by taking as given the $\{p_{i,t}, W_t, G_t\}$ for every $t \in \{0, +\infty\}$ and $i \in \Omega$. By setting the Lagrangian with $\beta^t \lambda_{H,t}$ the Lagrange multiplier:

$$E_t \sum_{t=0}^{\infty} \beta^t U(q_{i,t}, N_t) - \beta^t \lambda_{H,t} \Big[\int_{i \in \Omega} p_{i,t} q_{i,t}^c di + c_t B_t - N_t W_t - B_{t-1} - \int_{i \in \Omega} \Gamma_t(i) \Big]$$

The set of efficiency conditions is:

$$q_{i,t}^c: \quad \alpha - \gamma q_{i,t}^c - \eta \int_{i \in \Omega} q_{i,t}^c di = \lambda_{H,t} p_{i,t} \tag{52}$$

$$N_t: \quad \lambda_{H,t} W_t = N_t^{\phi} \tag{53}$$

$$c_t: \quad c_t = \beta E_t \Big(\frac{\lambda_{t+1}}{\lambda_{H,t}} \Big) \tag{54}$$

With transversality condition on borrowing:

$$\lim_{T \to \infty} E_t \Big[\beta^{T-t} \frac{Uc,t}{U_{n,t}} \frac{B_T}{P_T} \Big] \tag{55}$$

The transversality condition will ensure equality in the budget constraint for each t.

By not having the numeraire good as in the Melitz-Ottaviano model I include the income effect. The new demand function as in Ottaviano(2011) is containing λ and is the following :

$$\lambda_{H,t} p_{i,t} = \alpha - \gamma q_i^c - \eta Q^c \tag{56}$$

As usual, $\lambda_{H,t} p_{i,t}$ is equal to the marginal utility of consumption of variety i. Moreover, the marginal utility of consumption includes the total consumption for all the varieties Q^c.

Before going more in-depth into the demand function, by combining Equation 52, Equation 53 and Equation 54, I get a function that describes the optimal marginal rate of substitution between consumption of a variety i and hours worked should be equal to the ratio of wage with its price:

$$\frac{-U_{N_t}}{U_{q_{i,t}}} = \frac{W_t}{P_{i,t}} \tag{57}$$

To find the Euler equation I solve for the expectations in t but for the period t+1. Therefore:

$$q_{i,t+1}^c: \quad E_t(\alpha - \gamma q_{i,t+1}^c - \eta \int_{i \in \Omega} q_{i,t+1}^c di) = E_t(\lambda_{t+1} p_{i,t+1}) \tag{58}$$

Because of the two equations :

$$c_t = \beta E_t(\frac{\lambda_{t+1}}{\lambda_t}) \tag{59}$$

$$1 = \beta(1+i_t)E_t\frac{u_{q_{i,t+1}}}{u_{q_{i,t},t}}\frac{p^c_{i,t}}{p^c_{i,t+1}} \tag{60}$$

The Equation 59 relation gives us a valuable relation about the current and expected future $\lambda_{H,t}$. Firstly, I have to note that $(1+i_t) = \frac{1}{c_t}$ is the nominal interest rate for one period. Since I take that the nominal interest rate should be equal to the gross yield of the risk-less bond:

$$\beta E_t(1+i_t)\lambda_{t+1} = \lambda_{H,t} \tag{61}$$

Now going back to the demand function, $q^c_{i,t}$ is the consumption of variety i by each household. To find the total consumption, I assume that all the households are identical and there is no heterogeneity: $q_{i,t} = L * q^c_{i,t}$. Moreover, q_i should be positive to be consumed. Therefore, I take a subset $\Omega* \subseteq \Omega$ that contains all the varieties i that are consumed and let O denote the number of them. By integrating both sides of the equation of marginal utility of consumption I can derive in the end:

$$aO_t - (\gamma + \eta O_t)Q^c_t = \lambda_{H,t}\int_{i\in\Omega*} p_{i,t}di = \lambda_{H,t}O_t\bar{P}_t \tag{62}$$

$$Q_t = \frac{(aLO_t - \lambda_{H,t}LO_t\bar{P}_t)}{(\gamma + \eta O_t)} \tag{63}$$

Therefore, the total production of all the varieties depends on the number of firms that are during the period t in the market while it depends negatively on the product of marginal utility of income and average price.

F.2 Counsumption-Saving Decisions

In this model, the consumption-saving decisions of households are governed by the following equation:

$$\alpha - \gamma q_{i,t} - \eta Q_t = \beta(1+i_t)E_t(\alpha - \gamma q_{i,t+1} - \eta Q_{t+1})(\frac{P_{i,t}}{P_{i,t+1}}) \tag{64}$$

This equation, however, does not account for the aggregate price level, and the entry and exit of firms may influence it. By integrating both sides, we obtain:

$$Q_t = L\frac{(aO_t - \lambda_{H,t}\int_{i\in\Omega} pi_t di)}{(\gamma + \eta O_t)} \iff (\gamma + \eta O_t)Q_t - aLO_t = -L\lambda_{H,t}O_t\bar{P}_t \tag{65}$$

where $\bar{P}_t$ is the average price level. By taking this equation and forming the Euler equation:

$$(\gamma + \eta O_t)Q_t - aLO_t = \beta(1 + i_t)E_t \frac{\bar{P}_t}{\bar{P}_{t+1}} \frac{O_t}{O_{t+1}} \Big((\gamma + \eta O_{t+1})Q_{t+1} - aLO_{t+1} \Big) \tag{66}$$

The Euler equation includes an additional element compared to the standard version: the ratio $\frac{O_{H,t}}{O_{H,t+1}}$ which represents the change in the number of varieties available. Households prefer to spread their consumption across different goods, so an increase in the number of varieties can boost their marginal utility, while a decrease can reduce it. This element reflects how shifts in market dynamics, such as the entry and exit of firms, impact consumption choices and marginal utility by altering the range of available products.

F.3 Demand Function and Elasticity of Demand

By substituting the demand function for c_i^C and noting that the average price $\bar{P}_t = \frac{P_t}{O_t}$, where $P_t = \int_{i \in \Omega} pi_t$, I reach the following:

$$c_{i,t} = \frac{\alpha L}{\gamma + \eta O_t} - \frac{\lambda_{H,t} L p_{i,t}}{\gamma} + \frac{\eta \lambda_{H,t} L P_t}{\gamma(\gamma + \eta O_t)} \tag{67}$$

This is the consumption for each variety i by all households in an economy. Furthermore, by examining the demand function and substituting the relationship for the C_t^c, there is a maximum price $pmax_t$ a variety can have to be produced. That is when $c_i^c = 0$:

$$p_{i,t} \leq \frac{\frac{\alpha}{\lambda_{H,t}}\gamma + \eta P_t}{\gamma + \eta O_t} = pmax_t \tag{68}$$

So $pmax_t$, known in the literature as *Choke price*, is the maximum price at which a firm can sell its product, as no purchases will occur at higher prices. All varieties that sell $i \in \Omega^*$ satisfy this property, and the total number of varieties is O_t. Moreover, $pmax_t$ is related to the level of competition in the market. The inverse demand function can be written as:

$$p_{i,t} = pmax_t - \frac{\gamma}{\lambda_{H,t} L} c_{i,t} \tag{69}$$

Finally, with this utility function, the price elasticity of demand is not stable, unlike with CES preferences. More specifically:

$$\epsilon_i = \frac{dc_i}{dp_i}\frac{p_i}{c_i} = \Big(\frac{pmax_t}{p_{i,t}} - 1\Big)^{-1} = \Big(\frac{pmax_{H,t}}{pmax_{H,t} - \frac{\gamma}{\lambda_{H,t}L}c_{i,t}} - 1\Big)^{-1} \tag{70}$$

F.4 Final Good Firms

The equations for the price; revenues profit π_t, and markups μ_t of each variety i are:

$$p_{i,t} = \frac{P^I_{H,t}}{2}(v^H_{H,t} + v_{i,t}) \tag{71}$$

$$R_{i,t} = \frac{\lambda_{H,t} L (P^I_{H,t})^2}{4\gamma}[(v^H_{H,t})^2 - (v^H_{i,t})^2] \tag{72}$$

$$\pi_{i,t} = \frac{\lambda_{H,t} L (P^I_{H,t})^2}{4\gamma}(v^H_{H,t} - v^H_{i,t})^2 \tag{73}$$

$$\mu_t = \frac{P^I_{H,t}}{2}(v^H_{H,t} - v^H_{i,t}) \tag{74}$$

Hence, the most productive firms (and the lower v_i) will have lower product prices and higher markups. Moreover, they will have higher profits and revenues than the firms with lower productivity. As for a change in the $v^H_{H,t}$, the individual price, revenues, profits, and mark-ups would be reduced(increased) in a decrease(increase) of $v^d_{H,t}$.

The exporters from Home to the other market face an "iceberg" cost [21] on its production equal to τ. Given the production function, the maximization problem can be solved separately. The equations change to:

$$p^H_{i,F,t} = \frac{\tau P^I_{H,t}}{2}(\frac{P^I_{F,t} v^F_{F,t}}{\tau P^I_{H,t}} + v^H_{i,t}) \tag{75}$$

$$R^H_{i,F,t} = \frac{\tau \lambda_{F,t} L (P^I_{H,t})^2}{4\gamma}((\frac{P^I_{F,t} v^F_{F,t}}{\tau P^I_{H,t}})^2 - (v^H_{i,t})^2) \tag{76}$$

$$\pi^H_{i,F,t} = \frac{\tau \lambda_{F,t} L (P^I_{H,t})^2}{4\gamma}(\frac{P^I_{F,t} v^F_{F,t}}{P^I_{H,t}} - \tau v^H_{i,t})^2 \tag{77}$$

$$\mu^H_{i,F,t} = \frac{\tau P^I_{H,t}}{2}(\frac{P^I_{F,t} v^F_{F,t}}{P^I_{H,t}} - \tau v^H_{i,t}) \tag{78}$$

$$q^H_{i,F,t} = \frac{\tau \lambda_{F,t} P^I_{H,t}}{2\gamma}(\frac{P^I_{F,t} v^F_{F,t}}{\tau P^I_{H,t}} - v^H_{i,t}) \tag{79}$$

Where, $v^H_{F,t} = \frac{P^I_{F,t} c^F_{F,t}}{\tau P^I_{H,t}}$ is the cut-off inverse productivity that a domestic firm needs to have to export to the foreign market. This relationship contains the ratio of the input prices in the two markets since it can affect the overall marginal cost of production. The model allows each firm to set different prices for each destination since the competition captured by the $c^H_{F,t}$ and $c^H_{H,t}$ leads to different pressures on the markups, output, and prices.

[21] Which is related to transportation costs, advertisement etc.

F.5 Price, Consumption and Output

The average output per firm in the home market is also a weighted average of outputs from domestic and foreign firms.

$$\bar{P_{H,t}} = \frac{P_{H,t}}{O_{H,t}} = \int_0^{v_{H,t}^H} p_{H,i,t}^H dG_t(v^H) + \int_0^{v_{H,t}^F} p_{H,i,t}^F dG_t(v^F) =$$
$$= \frac{O_{H,t}^H \frac{2\kappa+1}{2(\kappa+1)} P_{H,t}^I v_{H,t}^H + O_{H,t}^F \frac{2\kappa_F+1}{2(\kappa_F+1)} P_{H,t}^I v_{H,t}^H}{O_{H,t}}$$

Where $O_{H,t}^H$ is the number of Home firms that sell in the home market while $O_{F,t}^H$ is the number of Home firms that sell in the foreign market.

The average output is equal to the average of the average output of the domestic firms weighted by the number of the domestic firms and the average output of the domestic firms that export to the foreign market.

$$\bar{Q_t^H} = \frac{Q_t^H}{O_{H,t}^H} = \int_0^{v_{H,t}^H} q_{F,i,t}^H dG_t(v^H) + \int_0^{v_{H,t}^F} q_{F,i,t}^H dG_t(v^H) =$$
$$= \frac{O_{H,t}^H \frac{\lambda_{H,t}}{2\gamma(\kappa_H+1)} P_{H,t}^I v_{H,t}^H + O_{F,t}^H \frac{\lambda_{F,t}}{2\gamma(\kappa_H+1)} P_{F,t}^I v_{F,t}^F}{O_t^H}$$

Similarly the markups:

$$\bar{\mu_t^H} = \frac{\mu_{H,t}}{O_{H,t}} = \int_0^{v_{H,t}^H} \mu_{H,i,t}^H dG_t(v^H) + \int_0^{v_{H,t}^F} \mu_{H,i,t}^F dG_t(v^F) = \frac{O_{H,t}^H \frac{P_{H,t}^I v_{H,t}^H}{2(\kappa_H+1)} + O_{H,t}^F \frac{P_{H,t}^I v_{H,t}^H}{2(\kappa_F+1)}}{O_{H,t}}$$

Finally, the consumption of final good is the same for firms with the same productivity foreign or domestic. Again, differences in the productivity distributions of the firms will lead to different average consumption of domestic and foreign goods. Here, a different movement of the cutt-off productivity is able to lead to a different weight of domestic and foreign firms leading to different changes in the consumption of domestic and foreign good.

$$\bar{C_{H,t}} = \frac{Q_{H,t}}{O_{H,t}} = \int_0^{v_{H,t}^H} q_{H,i,t}^H dG_t(v^H) + \int_0^{v_{H,t}^F} q_{H,i,t}^F dG_t(v^F) =$$
$$= \frac{O_{H,t}^H \frac{\lambda_{H,t}}{2\gamma(\kappa_H+1)} P_{H,t}^I v_{H,t}^H + O_{H,t}^F \frac{\lambda_{H,t}}{2\gamma(\kappa_F+1)} P_{H,t}^I v_{H,t}^H)}{O_{H,t}}$$

F.6 Price Index, Consumption and Output

To understand inflation and its movements, it is essential to determine each economy's price index by weighting the consumption of each good accordingly. The production of the final good in each economy can be represented as the sum of domestic consumption of these goods and the exports they generate:

$$Q^H = Q^H_{H,t} + Q^H_{F,T} = O^H_{H,t}\frac{L}{2\gamma(\kappa_H+1)}\lambda_{H,t}P^I_{H,t}v^H_{H,t} + O^H_{F,t}\frac{L}{2\gamma(\kappa_H+1)}\lambda^F_{H,t}P^I_{F,t}(v^F_{F,t}) \tag{80}$$

The consumption of the final good in each economy is equal to the sum of domestic consumption of domestically produced goods and imports from foreign markets:

$$C_{H,t} = Q^H_{H,t} + Q^F_{H,T} = Q_{H,t} = O^H_{H,t}\frac{\lambda_{H,t}}{2\gamma(\kappa_H+1)}P^I_{H,t}v^H_{H,t} + \frac{\lambda_{H,t}}{2\gamma(\kappa_F+1)}O^F_{H,t}P^I_{H,t}v^H_{H,t} \tag{81}$$

The price index is calculated as the price of each good weighted by its share in total consumption:

$$P^H_t = \frac{O^H_{H,t}\int_0^{v^H_{H,t}} p^H_{i,t}q^H_{i,t}dG_t(v^H) + O^F_{H,t}\int_0^{v^H_{H,t}} p^F_{i,t}q^F_{i,t}G_t(v^F)}{C_{H,t}} = \tag{82}$$

$$= \frac{O^H_{H,t}\frac{\lambda_{H,t}P^I_{H,t}{v^H_{H,t}}^2}{4\gamma(\kappa_H+2)} + O^F_{H,t}\frac{\lambda_{H,t}P^I_{H,t}{v^H_{H,t}}^2}{4\gamma(\kappa_F+2)}}{C_{H,t}} \tag{83}$$

F.7 Raw Materials and Intermediate Inputs

$$I_{H,t} = O^H_{H,t}\int_0^{v^H_{H,t}}\frac{\lambda_{H,t}P^I_{H,t}L}{2\gamma}(v^H_{H,t}-v_{i,t})v_{i,t}dG(v^H) + O^H_{F,t}\int_0^{v^H_{H,t}}\frac{\lambda_{F,t}\tau P^I_{H,t}L}{2\gamma}(v^H_{F,t}-v_{i,t})v_{i,t}dG(v^H) =$$

$$= \frac{\lambda_{H,t}P^I_{H,t}L}{2\gamma}\int_0^{v^H_{H,t}}(v^H_{H,t}-v_{i,t})\frac{\kappa_H v_{i,t}^{\kappa_H}}{(v^H_{H,t})^\kappa_H}dv + \frac{\lambda_{F,t}\tau P^I_{H,t}L}{2\gamma}\int_0^{v^H_{H,t}}(v^H_{F,t}-v_{i,t})\frac{\kappa_H v_{i,t}^{\kappa_H}}{(v^H_{F,t})^\kappa_H}dv =$$

$$\frac{\kappa_H\lambda_{H,t}P^I_{H,t}L}{2\gamma(v^H_{H,t})^\kappa_H}\Big(v^H_{H,t}\int_0^{v^H_{H,t}}v_{i,t}^{\kappa_H}dv - \int_0^{v^H_{H,t}}v_{i,t}^{\kappa_H+1}dv\Big) + \frac{\kappa_H\lambda_{F,t}\tau P^I_{H,t}L}{2\gamma(v^H_{F,t})^\kappa_H}\Big(v^H_{F,t}\int_0^{v^H_{F,t}}v_{i,t}^{\kappa_H}dv - \int_0^{v^H_{F,t}}v_{i,t}^{\kappa_H+1}dc\Big) =$$

$$\frac{\kappa_H\lambda_{H,t}P^I_{H,t}L}{2\gamma(v^H_{H,t})^\kappa_H}\Big(v^H_{H,t}\Big[\frac{c_{i,t}^{\kappa_H+1}}{\kappa_H+1}\Big]_0^{v^H_{H,t}} - \Big[\frac{c_{i,t}^{\kappa_H+2}}{\kappa_H+2}\Big]_0^{v^H_{H,t}}\Big) + \frac{\kappa_H\lambda_{F,t}\tau P^I_{H,t}L}{2\gamma(v^H_{F,t})^\kappa_H}\Big(v^H_{F,t}\Big[\frac{v_{i,t}^{\kappa_H+1}}{\kappa_H+1}\Big]_0^{v^H_{F,t}} - \Big[\frac{v_{i,t}^{\kappa_H+2}}{\kappa_H+2}\Big]_0^{v^H_{F,t}}\Big) =$$

$$\frac{\kappa_H\lambda_{H,t}O^H_{H,t}P^I_{H,t}L_H}{2\gamma(\kappa_H+1)(\kappa_H+2)}(v^H_{H,t})^2 + \frac{\kappa_H\lambda_{F,t}O^H_{F,t}L_F}{2\gamma(\kappa_H+1)(\kappa_H+2)}\frac{(P^I_{F,t})^2}{\tau P^I_{H,t}}(v^F_{F,t})^2 + f_E O^H_{H,t}$$

Free Entry

$$\int_0^{v^H_{H,t}} \pi_{i,t} dG(v^H) = \int_0^{v^H_{H,t}} \frac{\lambda_{H,t} L (P^W_{H,t})^2}{4\gamma} (v^H_{H,t} - v_{i,t})^2 dG(c^H) + \int_0^{v^F_{H,t}} \frac{\tau^2 \lambda_{H,t} L (P^w_{H,t})^2}{4\gamma} (\frac{P_{F,t} v^F_{F,t}}{\tau P^W_{H,t}} - v_{i,t})^2 dG(v^H) =$$

$$= \frac{\lambda_{H,t} L (P^W_{H,t})^2}{4\gamma} \int_0^{c^H_t} ((v^H_t)^2 - 2(v_{i,t} c^H_t) + v^2_{i,t}) \kappa_H + \frac{v^{\kappa_H - 1}_{i,t}}{(v^M_H)^\kappa_H} +$$
$$+ \frac{\lambda^F_{H,t} L (P^W_{H,t})^2}{4\gamma} \int_0^{v^F_{H,t}} ((\frac{P_{F,t} v^F_{F,t}}{\tau P^W_{H,t}})^2 - 2(v_{i,t} \frac{P_{F,t} v^F_{F,t}}{\tau P^W_{H,t}}) + v^2_{i,t}) \kappa_H \frac{v^{\kappa_H - 1}_{i,t}}{(v^M_H)^\kappa_H} =$$

$$= \frac{\kappa_H \lambda_{H,t} L (P^W_{H,t})^2}{4\gamma (v^M_H)^\kappa_H} ((v^H_{H,t})^2 \int_0^{v^H_{H,t}} v^{\kappa_H - 1}_{i,t} - 2 v^H_{H,t} \int_0^{v^H_{H,t}} v^{\kappa_H}_{i,t} + \int_0^{v^H_{H,t}} v^{\kappa_H + 1}_{i,t}) +$$
$$+ \frac{\kappa_H \lambda_{F,t} L (\tau P^W_{H,t})^2}{4\gamma (c^M_H)^\kappa_H} ((v^F_{F,t})^2 \int_0^{v^F_{H,t}} v^{\kappa_H - 1}_{i,t} - 2 v^F_{F,t} \int_0^{v^F_{H,t}} v^{\kappa_H}_{i,t} + \int_0^{v^F_{H,t}} v^{\kappa_H + 1}_{i,t}) =$$

$$= \frac{\kappa_H \lambda_{H,t} L (P^W_{H,t})^2}{4\gamma (v^M_H)^\kappa_H} \Big(\frac{(v^H_{H,t})^\kappa_H}{\kappa_H} - 2 \frac{(v^H_{H,t})^{\kappa_H + 2}}{\kappa_H + 1} + \frac{(v^H_{H,t})^{\kappa_H + 2}}{\kappa_H + 2} \Big) +$$
$$+ \frac{\kappa_H \lambda_{F,t} L (\tau P^W_{H,t})^2}{4\gamma (v^M_H)^\kappa_H} \Big(\frac{(v^F_{H,t})^{\kappa_H + 2}}{\kappa_H} - 2 \frac{(v^F_{H,t})^{\kappa_H + 2}}{\kappa_H + 1} + \frac{(v^F_{H,t})^{\kappa_H + 2}}{\kappa_H + 2} \Big) =$$

$$= \frac{\lambda_{H,t} L (P^W_{H,t})^2}{4\gamma (\kappa_H + 1)(\kappa_H + 2)(v^M_H)^{\kappa_H + 2}} \big((\kappa_H + 1)(\kappa_H + 2)(c^H_t)^{\kappa_H + 2} - (\kappa^2_H + 3\kappa_H)(c^H_t)^{\kappa_H + 2} \big)$$

$$+ \frac{\tau^2 \lambda_{F,t} L (P^W_{H,t})^2}{4\gamma (\kappa_H + 1)(\kappa_H + 2)(v^M_H)^{\kappa_H + 2}} \big((\kappa_H + 1)(\kappa_H + 2)(v^F_{H,t})^{\kappa_H + 2} - (\kappa^2_H + 3\kappa_H)(v^F_{H,t})^{\kappa_H + 2} \big)$$

$$\iff \frac{L P^W_{H,t}}{4\gamma (\kappa_H + 1)(\kappa_H + 2)(v^M_H)^\kappa_H} \big(2\lambda_{H,t} (v^H_{H,t})^{\kappa_H + 2} + 2\tau^2 \lambda_{F,t} (v^F_{H,t})^{\kappa_H + 2} \big) = f_E$$

$$v^H_{H,t} = \big((f_E \frac{2\gamma (\kappa_H + 1)(\kappa_H + 2)(v^M_H)^\kappa_H}{\lambda_{H,t} L P^w_t} - \tau^2 \frac{\lambda_{F,t} L^F}{\lambda_{H,t} L^H} (\frac{(P^W_{F,t})}{\tau (P^W_{H,t})} v^F_{F,t})^{\kappa_H + 2} \big)^{\frac{1}{\kappa_H + 2}}$$

By substituting the relationship for $v^F_{F,t}$, we obtain the final relationship for the home cut-off cost:

$$v^H_{H,t} = \Bigg(f_E \frac{2\gamma (\kappa_H + 1)(\kappa_H + 2)(v^M_H)^{\kappa_H}}{\lambda_{H,t} L_H P^I_{H,t}} - \tau^2 \frac{\lambda_{F,t} L_F}{\lambda_{H,t} L_H} (\frac{P^I_{F,t}}{\tau P^I_{H,t}})^{\kappa_H + 2}$$

$$\Big(f_E\frac{2\gamma(\kappa_F+1)(\kappa_F+2)(v_F^M)^{\kappa_F}}{\lambda_{F,t}L_F P_{F,t}^I}-\tau^2\frac{\lambda_{H,t}L_H}{\lambda_{F,t}L_F}(\frac{P_{H,t}^I}{\tau P_{F,t}^I}v_{H,t}^H)^{\kappa_F+2}\Big)^{\frac{\kappa_H+2}{\kappa_F+2}}\Bigg)^{\frac{1}{\kappa_H+2}} \tag{84}$$

Proofs

Proposition 3.1:

$$\begin{aligned}
\epsilon_i=\frac{dc_i}{dp_i}\frac{p_i^H}{c_i^H}=\Big(\frac{pmax_{H,t}}{p_{i,t}}-1\Big)^{-1}=\Big(\frac{pmax_{H,t}}{pmax_{H,t}-\frac{\gamma}{\lambda_{H,t}L}c_{i,t}}-1\Big)^{-1}=\\
=\Big(\frac{pmax_{H,t}}{pmax_{H,t}-\frac{1}{2}(P_{H,t}^I v_{H,t}^H-P_{H,t}^I v_{i,t}^H)}-1\Big)^{-1}=\\
=\Big(\frac{v_{H,t}^H}{v_{H,t}^H-\frac{1}{2}(v_{H,t}^H-v_{i,t}^H)}-1\Big)^{-1}=\\
=\Big(\frac{2v_{H,t}^H-v_{H,t}^H-v_{i,t}^H}{v_{H,t}^H+v_{i,t}^H}\Big)^{-1}=\\
=\Big(\frac{v_{H,t}^H-v_{i,t}^H}{v_{H,t}^H+v_{i,t}^H}\Big)^{-1}
\end{aligned}$$

Appendix G Evidence from Country-Sector Specific Data

Macro Data

The data I use for the first part are from Eurostat, CompNet, and Amadeus. I limit the countries of interest to the following members of the eurozone: Belgium, Germany, Spain, France, Italy, Netherlands, Portugal, and for the period 2000-2018. All these countries adopted the Euro in 2000. I use monthly frequencies that allow the high-frequency identification scheme. The monthly data includes short-term fluctuations that can be affected by monetary policy. Furthermore, I focus on the monetary policy shocks related to the "Overnight Index Swap" (OIS) rate from Jarociński and Karadi (2020). I use monthly data from Eurostat for industrial production (total manufacture and by sector), harmonized consumer prices index, and stock price index for each country. Each variable captures information about the state of the economy. Moreover, I extracted information from Eurostat on monthly country-by-country trade data. It contains free-of-base (FOB) exports from every country. Furthermore, I use firm-level data from Amadeus and country-sector-specific data from CompNet.

Seasonality in Eurostat data (e.g., in consumer prices index and trade) can be a severe issue for the analysis, affecting the interpretation. For instance, impulse response functions from VARs would have unexpected spikes. Therefore, the non-seasonally adjusted data are adjusted using the X-13 seasonal adjustment programs of the US Census Bureau. Furthermore, I exclude the period 2000-2002 since during these years, there was a lot of fluctuation ("noise") in monetary policy while the European integration had a strong effect on trade. The policy rate can capture the impact of conventional and unconventional monetary policies like "Forward Guidance." This gives another incentive to use the external instrument methods. However, the shocks used by Karadi-Jarocinski are on the 3-month OIS rate, capturing mainly the conventional monetary policies.

Trade Balances

The first step is to use Proxy-SVAR for each of the selected countries. I use monthly data on Industrial Production (total manufacture), harmonized consumer price index, stock price index, overnight index swap, and the intra-Euro trade balance. Moreover, I use also simple structural VAR with Cholesky decomposition and monetary policy shocks as the first variable.

$$\mathbf{Y} = \begin{bmatrix} CPI \\ IP \\ Stock \\ Trade \\ R_t \end{bmatrix} \tag{85}$$

The impulse response functions show similar effects on the macro variables, except the trade balances. After a contractionary monetary policy shock, the intra-Euro trade balance of Spain, Italy, and Portugal increased. On the other hand, Belgium, Germany and the Netherlands follow the opposite direction. As for France, the responses in the intra-euro trade balances are not significant. The graphs show the different responses to the level of trade balances. Although

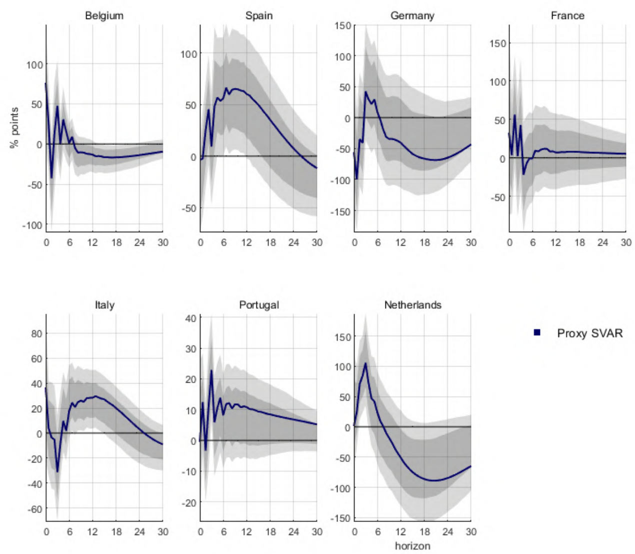


Figure G1: IRFs (Proxy-SVAR) for the intra-euro trade balances

the responses for Portugal and France are similar, the one for Portugal is significant (at the 68% confidence interval). Moreover, as a percentage of GDP is a lot higher.

Moreover, I use Bayesian local projections and VARS as in Miranda-Agrippino and Ricco (2021). I use as a pre-sample the period 2002-2006 and as a sample the period 2007-2016. Moreover, I use local projections for the whole period. The results seem to confirm the results of the Proxy-SVAR. Indeed, the intra-Euro trade balances of Spain, and Portugal increased while the ones for Germany, Netherlands, and Belgium decreased.

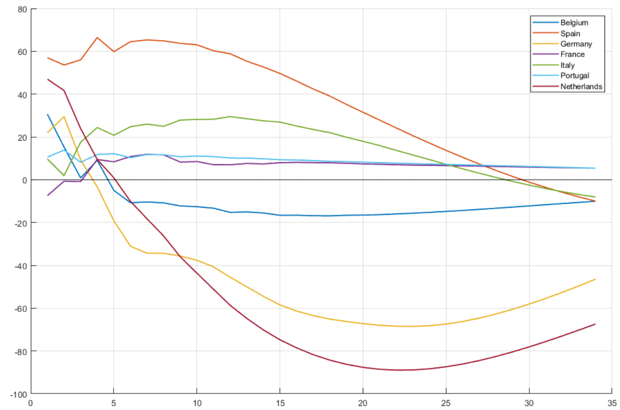


Figure G2: IRFs (Proxy-SVAR) for the intra-euro trade balances

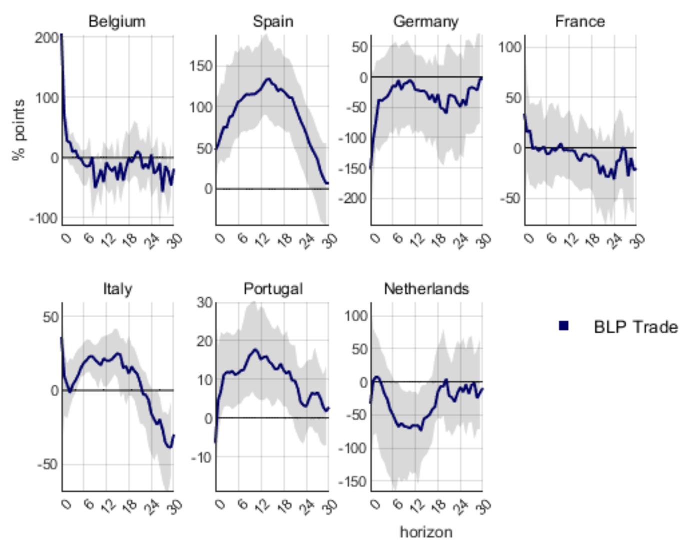


Figure G3: IRFs for the intra-euro trade balances

Effect of Productivity Distribution and Competition

To study if the effect of monetary policy varies across sectors and countries I use the monthly data by sector and country on industrial production and the intra-euro trade balances. Moreover, I use as control variables the lag of the dependent variable, the CPI, and the Stock Price index.

The two variables that this paper studies are the movement of industrial production and the intra-euro trade balances. Moreover, the range of years leads to a limited number of observations.

Running local projections containing all the data and dummy variables for each sector-country shows a negative effect of monetary policy on the industrial production of that specific sector-country, as was expected. However, the responses have diverse magnitudes. There is significant heterogeneity by countries and sectors. The main hypothesis is that when the productivity distribution is more skewed or when the shape parameter is lower there is a higher effect of the monetary policy. Moreover, if there is a higher competition (captured by the HHI index) there is again a higher effect. For this reason, I use local projections:

$$y_{t+h} = \alpha_0 + FE_{t+h} + \alpha_h \epsilon_t^M + \beta_h Prod_{t-12} \epsilon_t^m + \sum_{l=1}^{L} X_{t-l} + u_{t+h} \tag{86}$$

I include country-sector fixed effects to capture time-invariant information. Moreover, I include the lags of the dependent and the control variables. Moreover, I use the previous year's productivity/competition variables. The monetary policy shock is the Karadi-Jarocinski shocks. Therefore, the lags do not react to the monetary policy shock.

Here's a refined version of your text:

The coefficient of primary interest is δ, which captures the effect of a monetary policy shock interacting with the productivity/competition variable. Additionally, the coefficient α represents the average effect of a monetary policy shock. In the local projections concerning the productivity distribution, I use both the skewness and mean value, or shape and scale parameters, assuming a Pareto distribution.

While price indexes did not exhibit extreme values, even during the financial crisis, industrial production (measured at monthly frequencies) experienced notable and abrupt fluctuations. These changes could potentially affect the results, particularly concerning the role of concentration and productivity distribution. Specifically, under large shocks, the selection mechanism may diminish the importance of productivity distribution and concentration as the proportion of affected firms becomes more uniform. To address this, I present results that exclude the crisis period of 2008–2011 for industrial production, demonstrating that the findings related to industrial production are clearer when this period is omitted.

Results

The local projections reveal consistent and persistent patterns. In line with model predictions, industrial production increases more in highly concentrated markets, particularly when cross-industry differences are controlled for. Additionally, trade balance, Producer Price Index (PPI), and import prices from the euro area show a more significant decrease in more concentrated markets.

These findings are further supported when parameters from the Pareto estimation (from CompNet) are interacted with monetary policy shocks. The coefficient associated with the shape parameter is significant and positive when the dependent variable is trade balance, PPI, and import prices from the euro area, but negative when industrial production is the dependent variable. Higher concentration is indicated by a lower shape parameter, confirming that these results align with those derived from skewness analyses.

The most robust results are obtained when industry interactions with monetary policy shocks are included in the specification. This approach accounts for industry-specific movements in output, trade balance, and prices, highlighting cross-country differences more clearly. Furthermore, for both the time-invariant Pareto shape parameter and concentration, the results remain consistent with model predictions across all specifications tested.