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H. Burcu Gürcihan Yüncüler
Çağrı Sarıkaya

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TÜRKİYE CUMHURİYET
MERKEZ BANKASI

Address:
Central Bank of the Republic of Türkiye
Head Office
Structural Economic Research Department
Hacı Bayram Mah. İstiklal Caddesi No: 10
Ulus, 06050 Ankara, Türkiye

Phone:
+90 312 507 55 87

Facsimile:
+90 312 812 19 90

Profit Margins and Cost Pass-Through in Türkiye

Hatice Burcu Gürcihan Yüncüler[1], Çağrı Sarıkaya[2]

Abstract

This paper investigates the link between profit margins and cost pass-through to producer prices for the manufacturing sector in Türkiye. Using sector-level panel data, we show that pass-through is lower in industries with higher profit margins in line with the theory that predicts that stronger competition leads to greater pass-through. The impact of cost shocks is found to be more muted for export-oriented industries. In contrast, it is stronger for industries with higher import intensity and foreign currency leverage. We also test the significance of market concentration measures in explaining cost pass-through as alternative indicators of market power. While the dispersion of profit rates is found to be an important source of the differentiation in cost pass-through across sectors, market concentration measures do not have significant impact.

Keywords: Producer prices, Cost pass-through, Profit margins, Market power, Market concentration.

JEL Codes: C23, D40, E31.

[1] E-mail: burcu.gurcihan@tcmb.gov.tr. Postal address: Structural Economic Research Department, Central Bank of the Republic of Türkiye, Saray Mah. Küçüksu Cad. No:64/B Ümraniye, İstanbul, Türkiye.
[2] E-mail: cagri.sarikaya@akbank.com. Postal address: Akbank Genel Müdürlüğü, Sabancı Center, 4. Levent 34330, İstanbul, Türkiye.

Non-Technical Summary

The pass-through of cost shocks to prices and the factors affecting it are among the important issues for policymakers. The transformation in the global trade environment, encompassing international competition, market size, firm size, and strategic complementarities in production has significantly impacted pricing decisions and inflation dynamics in the recent decades (Attinasi and Balatti, 2021; Lane, 2020; Forbes, 2019). One of the focuses of the recent literature is the role of market power in cost pass-through. Contrary to the standard assumptions in widely used macroeconomic models, markups are not fixed, leading to incomplete pass-through. Firms strategically adjust markups in response to cost shocks (Auer and Schoenle, 2016; Amiti et. al., 2019). Firms with higher profit margins possess greater capacity to absorb rising production costs without altering their prices, enabling them to maintain or seize market share.

In this paper, we investigate the link between profit margins and cost pass-through from a small-open economy perspective, by taking the manufacturing industry in Türkiye as our laboratory. Our empirical analysis centers on estimating the pass-through of domestic currency-denominated import prices on manufacturing prices, a significant element of overall production costs. In aggregate terms, our findings indicate a short-term import price pass-through of 45 percent on average. This figure closely aligns with estimates from prior studies (Kara and Öğünç, 2008; Yüncüler, 2011). Our findings offer evidence supporting the idea that profit margins play a role in absorbing the impact of cost shocks. Specifically, we observe that higher profit margins are associated with lower pass-through rates. In our analysis, the estimated pass-through is 1.35 points lower in response to a 10 percent rise in import prices, when profit margins are higher by 10 percentage points. Using the distribution of profit rates, this translates into a 2.3 percentage points reduction in pass-through at the median profit margin. In our regression analysis, we incorporate market concentration measures alongside profit margins as alternative indicators of market power. While the dispersion of profit rates contributes significantly to the variation in cost pass-through

across sectors, our results indicate that market concentration measures do not provide additional informative content. Consistent with previous research on pass-through in Türkiye, our findings suggest that the impact of cost shocks is less pronounced for export-oriented firms. Conversely, higher import intensity and foreign currency leverage are associated with stronger pass-through effect (Akgündüz and Fendoğlu, 2019; Ertuğ et al., 2020; Fendoğlu et al., 2020).

I. Introduction

The question of how changes in costs are transmitted to prices and the analysis of factors affecting pass-through are a central issue for policymakers. In recent years, there has been a growing interest in the role of market structure in cost pass-through. These studies depart from the standard assumptions of perfect competition and monopolistic competition, which imply constant markups and complete pass-through. In reality, markups are variable, and firms adjust them strategically in response to cost shocks. Auer and Schoenle (2016) and Amiti et al. (2019) point to the role of firm heterogeneity in terms of cost-efficiency and strategic pricing as key sources of variable markups, leading to incomplete cost pass-through. Firms with higher profit margins benefit from more capacity to resist the rise in production costs without changing their prices, enabling them to retain or seize market share. This paper is related to the widely documented endogenous markups and incomplete pass-through literature concerning the association between market structure and pricing behavior.[3] We investigate the link between profit margins and cost pass-through from a small-open economy perspective by taking the manufacturing industry in Türkiye as our laboratory.

Despite the fast-growing literature on advanced economies, the role of market structure on pricing behavior in Türkiye is as yet a young field of research. The current literature on inflation dynamics generally focuses on estimating the degree of exchange rate pass-through, its evolution in the last decades, and its relation to business cycles and expectations.[4] Only recently, several studies have drawn attention to the role of firm/sector-specific drivers of exchange rate pass-through, such as import intensity and foreign

[3] The seminal work of Melitz and Ottaviano (2008) shows how the market size and degree of competition affect average markups. See Rodriguez-Lopez (2011) for the theoretical explanation of the observed low exchange rate pass-through in developed economies in an endogenous firm entry/exit and markup setup. For incomplete pass-through under strategic pricing, see also Blass and Russ (2015), Auer and Schoenle (2016), Benigno and Faia (2016), and Amiti et al. (2019).

[4] See Leigh and Rossi (2002), Kara et al. (2005), Kara and Öğünç (2008), Yüncüler (2011), and Kara and Sarıkaya (2021) for exchange rate pass-through estimates obtained through vector autoregression (VAR) models and time-varying parameter (TVP) Phillips curves. See also Arbatlı (2003) and Kara et al. (2017a) for how exchange rate pass-through changes with respect to the state of economic activity or exchange rate expectations.

currency (FX) leverage/indebtedness (Akgündüz and Fendoğlu, 2022; Ertuğ et. al., 2020; Fendoğlu et. al., 2020). Hence, we aim to contribute to the current literature by exploring the link between market power and cost-pass through in Türkiye. To the best of our knowledge, this constitutes the first attempt to analyze this relation. Since material input cost is the major component of total costs in the manufacturing sector in Türkiye, we focus on the impact of import price and exchange rate.

In the empirical analysis, we estimate the pass-through of domestic currency-denominated import prices on manufacturing prices, a significant component of aggregate production costs. Due to the high frequency of shocks to import prices and the detailed sector-level data in Türkiye, we are able to make a clear econometric identification in estimating the impact of profits on pass-through. Consistent with the literature, we find that cost pass-through is lower in industries with higher profit margins. In our analysis, we control for various firm characteristics, such as the share of import content in the production process, net exporter position, and the degree of FX indebtedness. We show that higher net exports and lower FX leverage broaden the room for maneuver against import price/exchange rate shocks.

We estimate the impact of profit margins on import price pass-through in the manufacturing industry at the 4-digit sector level by following a similar empirical strategy to Fendoğlu et al. (2020). In aggregate terms, we estimate short-term import price pass-through to be 45 percent on average, close to the estimates of the previous studies (Kara and Öğünç, 2008; Yüncüler, 2011). More specifically, a 10 percent rise in Turkish lira (TL)-denominated import prices increases producer inflation by 3.55 percentage points in the same quarter, followed by a one-quarter lagged effect of an additional 0.95 percentage points. We find strong evidence for the cost-cushioning impact of profit margins, consistent with the theoretical and empirical literature on variable markups and incomplete pass-through. Higher profitability is found to be cost absorbing, as the mean profit rate of around 18 percent tapers about half of the average pass-through in the raw model. We also find that import price pass-through is positively related to FX leverage and import intensity, in line with the findings of earlier studies. Using all control variables, including the balance

sheet (FX indebtedness) and the trade (net export position) channels and several selected financial ratios, we estimate pass-through to be lower by 1.44 points in response to a 10-percent rise in import prices when profit margins are higher by 10 percentage points. The estimated coefficient translates into a cost-cushioning impact of 1.5 percentage points at the 10th percentile, 2.5 percentage points at the median, and 3.9 percentage points at the 90th percentile of the distribution of profit rates. As a robustness check, we also test for the significance of market concentration measures in the regression analysis as alternative indicators of market power. While the dispersion of profit rates is found to be an important source of the differentiation in cost pass-through across sectors, market concentration measures do not provide additional information content.

The paper is organized as follows: In Section 2, we proceed with an overview of the literature and widely cited conceptual discussions of the measurement of market power. Section 3 provides a brief historical perspective on the evolution of profit margins in Türkiye and their main drivers in the last few decades. In this section, we also discuss the relationship between market concentration and profit margins in the manufacturing industry and explain the rationale behind our choice of variable as the proxy for market power. Section 4 presents information on the data, empirical methodology, and identification strategy. In Section 5, we provide the empirical results. Finally, Section 6 concludes with general remarks and possible extensions for future research.

II. Literature

II.i. Global Background and Stylized Facts

The stable low inflation environment during the last decades prior to the pandemic and the international evidence for the co-movement of inflation rates in the global economy have raised the question of how the changes in industrial organization, global supply networks, and market power affect cost pass-through. In this context, firm-level studies focusing on the link between market structure and pricing behavior have drawn the attention of economists. The literature associates the global synchronization of inflation, the

flattening of the Phillips curve, and the decline in cost pass-through with various secular trends, particularly in the US, and the global economy in general (Attinasi and Balatti, 2021; Lane, 2020; Forbes, 2019). Among these, the rise of "superstar firms" and the secular decline in the labor share of income stand out as the most commonly noted trends (Autor et al., 2020; Autor et al., 2017; Karabarbounis and Neiman, 2014; Elsby et al., 2013).[5] The main stylized facts are the steady uptrend in market concentration and the decline in firm entry, the increase in markups (even more significant in large and high-markup firms), falling investment rates, the rise in profitability as a result of falling labor and capital share, and increasing productivity differentials between firms (Gutiérrez and Philippon, 2017; Decker et al., 2014; Peltzman, 2014; De Loecker and Eeckhout, 2017; Hall, 2018).[6] As summarized by Lane (2020) and Attinasi and Balatti (2021), the other significant features of this period have been the integration of labor-abundant economies in global trade, rising trade openness, increasing factor mobility, decline in the labor force participation rate associated with population aging, and growing digitalization.[7] Putting aside the success of monetary policy regimes in mooring inflation expectations, these stylized facts, documented as the by-products of changes in global value chains, technological advancement, and demographics, are considered as key structural factors behind the globally synchronized low-inflation environment. Many studies argue that a common global component has primarily shaped the international inflation dynamics (Borio and Filardo, 2007; Ciccarelli and Mojon, 2010; Forbes, 2019). The globalization process, operating through

[5] See IMF (2017) for a detailed analysis of the global decline in labor income share. Autor et al. (2020) and Autor et al. (2017) focus on the fall of labor's share in GDP in most OECD countries and explain this phenomenon with the rise of superstar firms, which have higher innovation capacity, higher markups, and lower share of labor. The growth in the market share of these firms carries these features to the aggregate level (called as "re-allocation effect"), while unweighted indicators of labor's share and markups do not move in the same way.

[6] Gutiérrez and Philippon (2017) document several stylized facts of the post-1980s in the US, such as increasing concentration, declining business dynamism with falling entry/exit rates, decreasing investment rates (driven by concentrating industries), and rising profit margins (led by leader firms). Peltzman (2014) reports prolonged stability in market concentration for the manufacturing industry in the US between the 1960s and 1980s, followed by a significant uptrend after some major changes in market regulation policies. De Loecker and Eeckhout (2017) and Hall (2018) highlight the rise in markups in the US since the 1980s, and the former study also notes the change in its distribution toward high-markup firms.

[7] Cavallo (2018) empirically shows how digitalization and online competition affect the pricing behavior in the US retail sector.

stronger trade linkages and international spillovers, has reduced the responsiveness of inflation to domestic factors in many economies.[8] Hence, globalization-led transformations in the microstructure of economies have also brought about persistent changes in macro trends.

II.ii. Market Power and Cost Pass-Through: A Multi-Dimensional Question

The structural shifts in microstructure, i.e., product and labor markets, have important implications for macroeconomic policy design, particularly for the widely accepted standard models used in monetary policy conduct (Aquilante et al., 2019). However, the role of market structure in price-setting is still an open question, as the literature on the relationship between market power and cost pass-through has yet to reach a broad consensus. Regarding the cost-shock absorption capacity of firms (the extent of markup adjustment against cost shocks), the existing studies underline the key roles of cost-efficiency/productivity on the supply side and elasticity of substitution on the demand side. Under the standard textbook case of perfect competition between homogenous firms with constant marginal costs, pass-through is complete. The assumption of monopolistic competition with constant markups and constant elasticity of substitution (CES) also generates a complete pass-through in the absence of strategic pricing. In this case, the effects of cost shocks are industry-wide, with no divergences among firms. However, in reality, firms are heterogeneous in terms of technology and productivity and are subject to domestic and foreign competition under different types of (industry-specific) demand curves. The competitive environment generally leads to variable markups, considered as the primary source of incomplete cost pass-through in the literature.

The departure from standard assumptions of competitive markets, and thereby the incorporation of firm heterogeneity and strategic pricing have been the key features of recent studies. Auer and Schoenle (2016) provide evidence for the presence of strategic pricing through which firms do not only respond to changes

[8] De Soyres and Franco (2019) and Auer et al. (2017) examine the role of global value chains in the synchronization of inflation across countries. See also Lane (2020), Borio and Filardo (2007), Mumtaz and Surico (2012) and Ciccarelli and Mojon (2010).

in their own costs but also to changes in the costs of their competitors, which may constrain cost pass-through. They show that the response of prices to own (competitors') cost changes is U-shaped (hump-shaped) with respect to market share. This mirror reverse relation between own cost pass-through and cross-price elasticity is similar to the evidence provided by Amiti et al. (2019), who estimate the sum of these elasticities as unity. They show that the share of own and cross-price elasticity within overall unitary elasticity depends on the market's competitive structure. They find that cost pass-through is complete for small firms in line with the predictions of monopolistic competition under a CES demand function, while a few large firms with high market share exhibit incomplete pass-through due to strategic interactions. This interaction causes firms to respond not only to their costs but also to their competitors' costs, which gives rise to a positive cross-price elasticity estimate (the response to a competitor's price change). Thus, the main result is that market power may reduce cost pass-through in aggregate terms unless strategic moves cancel each other out. Benigno and Faia (2016) investigate the role of foreign firm penetration in the domestic market on exchange rate pass-through under endogenous markups. They theoretically posit that higher competition and a higher number of products make prices more responsive to costs through lower monopoly power and higher steady-state elasticity of substitution.[9] However, the empirical evidence they provide is ambiguous. They find that only for some sectors has foreign market penetration into the domestic market increased exchange rate pass-through. In contrast to common intuition, Ritz (2019) shows that market power can increase pass-through under certain conditions for cost convexity, i.e. increasing marginal costs. There is a wide range of empirical evidence in this fast-growing literature. However, there is no unique answer to the question of how market power affects pass-through, as the

[9] The presence of foreign firms in domestic product markets, and thus the corresponding rise in the number of products and degree of competition is expected to affect the shape of the Phillips curve. In this setting, the share of foreign firms in the market and strategic interactions bring important modifications to the underlying structural parameters of the standard New Keynesian Phillips curve with monopolistic competition.

optimal response of prices to cost shocks is influenced by the market structure, heterogeneity in firms' production technologies, and demand conditions.

In a perfectly competitive market, pass-through at the industry level is determined by the relative elasticities of demand and supply. Given the elasticity of supply, pass-through is higher when the consumers are less responsive to price (less elastic demand). Given the elasticity of demand, pass-through is higher when marginal cost drops less with the decline in output (more elastic supply). In this case, less of the cost shock is absorbed by the firms, and more is transmitted over prices. Putting aside the assumption of perfect competition, pass-through at the industry level is also determined by the curvature of the demand and strategic interactions between firms. In monopoly and oligopoly settings, firms consider how their decisions on setting price and quantity will influence demand. The curvature of demand influences those decisions. Theory predicts that, with constant marginal cost, competition leads to greater pass-through. Pass-through is likely to become smaller (larger) by upward (downward) sloping marginal cost (RBB Economics, 2014).

The capability of firms to cushion shocks affects the price response, as more productive and higher-markup firms exhibit more resilience against cost shocks. For instance, Melitz (2018) models the degree of competition and markups as endogenous with respect to the price elasticity of demand, and shows that cost-efficient firms can set higher markups, thus taper cost pass-through by adjusting markups to grow at the intensive margin of exports.[10] Under firm heterogeneity in terms of having different technologies, an endogenous countercyclical markup setting produces a similar cushioning effect in Andrés et al. (2021).

Cost pass-through at the product level under vertical and horizontal market structures has been another field of interest. Hong and Li (2013) analyze the US retail sector's pricing behavior by focusing on private label goods (both manufactured by the retailer and others) and national brands to understand the

[10] Melitz (2018) refers to Marshall's Second Law of Demand, presuming a concave demand curve (the elasticity of which increases with price) as a prerequisite for such a markup response.

dynamics of vertical structures. As the retailer's control over the value chain increases, i.e., when the retailer produces its brand, thereby reducing double marginalization, prices become closer to marginal cost (level effect). However, pass-through increases (change effect) compared to private labels (not manufactured by the retailer) and national brands. On the other hand, vertical integration, which strengthens cost pass-through by bringing the price closer to marginal cost, may eventually increase market shares and may strengthen strategic pricing motive, which in turn reduces pass-through. The net effect of these two counteracting channels of vertical integration on cost pass-through is found to be positive.

Overall, cost pass-through is affected by macroeconomic conditions, industry structure, and firm-specific characteristics. The general approach in the empirical analyses to assess the impact of market structure on price-setting is to make use of market power indicators. Nevertheless, market power, which essentially shows the capability of firms to push their prices above marginal cost, is not directly observable. In the following section, we briefly elaborate on this issue by introducing some basic concepts and discussing the relative advantages of using alternative indicators.

II.iii. Market Power: How to Measure?

One challenging task is measuring market power, which is generally proxied by market concentration, market share, and markups.[11] The first two proxies are easier to compute but may only partially represent the true market power. Markup is a more direct indicator of a firm's ability to set prices above marginal costs, albeit with some measurement difficulties (Syverson, 2019; Aquilante et al., 2019). Revenue-based concentration measures may be poor indicators of margins. In fact, concentration ratios and markups are not necessarily positively related. Hall (2018) documents the lack of a systematic relationship between the

[11] Market power is the firm's ability to influence its product price (the ability to set price above marginal cost), which means that the firm does not face a perfectly elastic residual demand curve (Syverson, 2019; Hall, 2018). The number of competitors, market entry costs, market concentration, and profitability are the typical metrics used to measure market power.

mega-firm ratio and price-to-marginal cost margin at sectoral level and concludes that the increase in market power does not necessarily imply a higher concentration ratio.[12] Andrés et al. (2021) argue that technologically advanced firms can increase their market share over time by setting lower prices in a market structure with few large and many small competitors. Eventually, strategic pricing might bring about a muted impact of cost shocks on prices for large firms. This cost-shock smoothing effect strengthens with the market share. Hence, a rise in concentration may not necessarily be an inflationary markup shock to the Phillips curve, as Andres et al. (2021) pointed out. Instead, technological heterogeneity among firms and potential gains in market share under strategic price competition would reduce cost pass-through in specific market structures. All in all, markup is a better measure of market power, however it is not flawless. As mentioned above, the measurement of the markup (price over marginal cost) is not straightforward since only the average cost is available in the data.[13]

II.iv. Cost Pass-Through in Türkiye: A Brief Background and Motivation

The existing literature on inflation dynamics in Türkiye mainly concentrates on imported inflation, with particular attention to exchange rate pass-through. Only recently, the macro approach based on time series models has started to be complemented by micro-level studies. The analyses relying on time series estimation methods primarily focus on how exchange rate pass-through has evolved, i.e. pre/post-floating exchange rate regime and single/double-digit inflation episodes.[14] Several studies try to address the asymmetry of exchange rate pass-through with respect to the phase of the business cycle, size and direction of the shock, and to different regimes for expectations of the future course of the exchange

[12] Hall (2018) derives this conclusion by looking at the relationship between the levels of markups and the mega-firm ratio, where firms with 10,000 or more workers are classified as mega firms. Nevertheless, a positive link between concentration and market power is not entirely ruled out when the changes in these two variables are considered.

[13] Nekarda and Ramey (2020) provide a detailed survey on alternative methods to measure markups and assess their cyclicality.

[14] Exchange rate pass-through is estimated for different periods using TVP Phillips curve and VAR models in Leigh and Rossi (2002), Kara et al. (2005), Kara and Öğünç (2008), Yüncüler (2011), Kara and Öğünç (2012), Kara and Sarıkaya (2021).

rate.[15] Kara et al. (2017b), Öğünç et al. (2018), and Kara and Sarıkaya (2021) broaden the focus to general inflation dynamics in TVP Phillips curve and VAR settings. These studies provide empirical evidence on the relative roles of the main determinants of inflation, i.e. sensitivity to import price, exchange rate, output gap, and labor cost, and elaborate on their evolution over time.

Regarding the last two decades, the general conclusions derived for the pass-through of individual cost components are as follows: (i) significant weakening in exchange rate pass-through after the transition to inflation targeting and floating exchange rate regimes in 2002, followed by a re-strengthening during the period of double-digit inflation after 2016, (ii) decline in import price pass-through following the global financial crisis, (iii) gradual flattening of the Phillips curve after the global and domestic financial crises in 2009 and 2018, (iv) relatively stable wage pass-through, albeit with a wide range of parameter uncertainty. Moreover, recent studies put greater emphasis on the increasing role of backward-looking behavior in price-setting and expectation formation, which results in a higher inflation persistence, making the inflationary effects of cost shocks more prolonged (Gülşen and Kara, 2021; Koç et al., 2021; Kara and Sarıkaya, 2021). Some of the studies above estimate the exchange rate and import price pass-through for different stages of the production chain by differentiating between wholesale/producer prices and consumer prices, and find stronger exchange rate pass-through to producer prices in line with the international evidence.[16]

During the last couple of years, there has been a growing interest in understanding the sources of sectoral heterogeneities in imported cost pass-through. As a first effort in turning the spotlight on the issue, Özmen

[15] Arbatlı (2003) investigates the presence of asymmetries with respect to the high/low states of economic activity, exchange rate and inflation, as well as to the size of the exchange rate changes, using threshold VAR models. Kara et al. (2005) divide their analysis sample into four, i.e. appreciation/depreciation periods and expansion/slowdown phases, and compare the estimated time-varying pass-through coefficients for these windows. Kara et al. (2017a) show how exchange rate pass-through changes over the business cycle and under the different states of exchange rate expectations by using Markov-switching models.

[16] See Leigh and Rossi (2002), Kara et al. (2005), Yüncüler (2011) and Ertuğ et al. (2020).

and Topaloğlu (2017) estimate exchange rate and import price pass-through to consumer price index (CPI) subgroups and point to the presence of an aggregation bias toward the underestimation of exchange rate pass-through when working with broad indices, i.e. CPI or core inflation. The question of why the sensitivity to exchange rate shocks varies across sectors has drawn attention in recent empirical research. In this context, a few studies relate imported cost pass-through to import intensity and FX indebtedness. Akgündüz and Fendoğlu (2022), using firm-to-firm sales and firm-product-destination level customs data, show that exporters that use more imported inputs or those working with import-intensive suppliers raise their producer-currency export prices significantly more in response to domestic currency depreciation. Ertuğ et al. (2020) report a positive association between imported cost pass-through and imported input use on a sectoral basis. Furthermore, they find the average response of sectoral prices to exchange rate shocks to be larger than the average response implied by imported input intensities, especially during the post-global financial crisis period. They propose the increased FX leverage of the corporate sector during this period as a possible source of the relatively strong exchange rate pass-through. Accordingly, they provide some preliminary findings for the positive association between "excess" exchange rate pass-through (defined as the difference between exchange rate pass-through and the share of imported inputs in total production costs) and FX liabilities, especially for short-term debt. Fendoğlu et al. (2020) offer solid support for this evidence with micro-level data. They find that the sectors in the manufacturing industry with higher net FX liabilities (sum of foreign liabilities and net imports as a percentage of total equity) increase their prices more in response to an exchange rate depreciation. Like Ertuğ et al. (2020), their results are more significant for short-term FX liabilities.

In this paper, we investigate how pass-through of cost shocks to domestic producer prices changes with market power in Türkiye, controlling for the effects of various structural aspects, such as import intensity, export share, and FX indebtedness. As a proxy for market power, we make use of profit margins. In the next part, we proceed with a brief discussion of the profit margins in Türkiye.

III. Profit Margins and Market Concentration in Türkiye

Our primary interest in this paper is to investigate whether market power, measured by profit margins, affects import price pass-through in the manufacturing industry, and if so, to what extent. The variable at the center of attention here is profit margins. Therefore, before going further into the empirical analysis, in this part, we provide more information on the characteristics of profit margins in the Turkish manufacturing industry. We first examine the course of profit margins over time and review the factors affecting it, and then, we compare profit margins with market concentration rates.

III.i. Profit Margins

Empirical studies on the Turkish economy have documented that profit margins respond to international competition, exchange rates, and inflation. Alongside the structural changes in these factors, profit margins in Türkiye displayed a significant variation over time (Figure 1). From the early 1990s, international competitive pressures started to increase due to the appreciation of the real exchange rate and the reductions in trade barriers. The real exchange rate appreciated by about 50 percent from the early 1990s until the global crisis in 2008. The real appreciation trend was temporarily interrupted during the 1994, 2001 and 2008 financial crises. Starting from 2011, this real appreciation trend reversed and the TL has lost significant value in real terms (Figure 2).

Looking at cross-country data, we see that variation in the real value of the TL over time has been sizable, and this variation has had a significant impact on profit rates. Using income statements of the firms quoted on the Istanbul Stock Exchange (ISE), Torağanlı (2010) shows that domestic currency appreciation reduces profits. Gürcihan-Yüncüler and Oral (2018) demonstrate that profit margins and exchange rate co-move positively (TL depreciations/appreciations lead to higher/lower profits), using quarterly data of manufacturing firms quoted in the ISE from 1993 to 2018. During the period that the TL gained value, reduced trade barriers further increased competitive pressures. One significant adjustment took effect after the entry to the customs union with the European Union in 1996. Following this landmark

adjustment, the profitability of the firms in Türkiye declined (Akkoyunlu-Wigley and Mıhçı, 2003; Taymaz and Yılmaz, 2015). Net trade exposure through exports, intermediate import use, and import competition accelerated in the early 2000s. Import penetration lowered profits in the manufacturing sectors (Yalçın, 2000).

Another important factor that has influenced the course of profit rates is inflation. Günay et al. (2005), covering the period 1980-1996, argue that the impact of trade openness on profit rates is limited; yet, profit rates are positively and significantly correlated with inflation. The reason that this paper gives modest credit to trade openness as a driver of profit rates might be due to the span of the analysis. It covers the period when trade openness was rather limited. However, this paper stands out with its reference to the impact of the high-inflation environment on profit rates. Tommasi (1994) presents a theoretical explanation for this fact. Accordingly, high inflation leads to high variations in prices. Firms can set higher markups in such an environment in which consumers are less informed about relative prices.

To sum up, the decline in the profit margins during the two decades following the early 1990s can be attributed to the higher international competition, the real appreciation trend of the lira and the sustained disinflation process.[17] Nevertheless, the reversal of the last two trends has started to feed through into rising profit margins during the last couple of years (Figure 1).

III.ii. Market Concentration vs. Profit Margins

Market power, which can be defined as a firms' ability to set prices above marginal cost, is an unobserved concept. In empirical studies, it is generally proxied by concentration ratios and markups. Yet, market concentration is not a pure indicator of pricing power, since a highly concentrated market may arise and be maintained under fierce price competition and shrinking profit margins to deter potential competitors. Hence, the relationship between the two indicators is not necessarily positive. On the other hand, while

[17] Gürcihan-Yüncüler and Oral (2018), using quarterly data from 1993-2018 period, document that the profit margins of the manufacturing firms quoted in the ISE are procyclical, after controlling for the impact of exchange rates.

profit margins may be a more representative indicator of market power, they are also an imperfect proxy. In this section, we examine the link between market concentration and profit rates in the manufacturing industry in Türkiye. Our analysis is not exempt from the common criticism about the precise measurement of the markup (price over marginal cost) since we use an "average" cost measure in constructing profit rates.

The manufacturing industry comprises 182 sectors at the 4-digit NACE Rev.2 classification. Figure 3 shows the concentration in the manufacturing industry based on the Herfindahl-Hirschman Index (HHI) during 2009-2015. We use the generally accepted thresholds for the HHI to categorize the sectors as high, moderate, and low-concentration industries. At first glance, there is a steady rise in the share of low-concentrated sectors, defined as those with an HHI lower than 0.15. The number of highly and moderately concentrated sectors with an HHI greater than 0.15 constituted 34 percent of the whole industry in 2009, while they declined to 26 percent six years later.[18]

After a quick look at the market structure in the manufacturing sectors, the next question is how market concentration is related to profitability. Table 1 presents the correlation matrix for the commonly used measures of concentration (CR4, the market share of the first four largest firms in the corresponding industry at the 4-digit level; CR8 the market share of the first eight largest firms in the corresponding industry at the 4-digit level and HHI) and profit rates. For any indicator of concentration, we find a positive but weak correlation between the two for each year. Considering alternative concentration indicators, their correlations with profit rates vary between 10 percent to 30 percent during 2009-2015 (Table 1).[19]

[18] The share of low-concentration sectors rose from two-thirds to three-quarters of the manufacturing industry from 2009 to 2015. The more competitive market structure was mainly driven by the furniture, motor vehicles, basic metals, and electrical machinery sectors. Beverages, other transport equipment, and chemical products were the other contributors to this shift.

[19] It is worth noting that the link between concentration and profit rates displays significant heterogeneity across sectors. The positive association is stronger for certain sectors such as textile, wearing apparel and leather, wood and cork products, paper products, fabricated metal, and electrical equipment. At the same time, there is no link or negative link in basic metals, electronic and optical equipment, and machinery and equipment.

Market concentration seems to be more indicative of profitability for domestic market-oriented sectors, while its information content weakens for export-oriented sectors. The top panel of Figure 4 exhibits the relationship between HHI and profit margins concerning the two clusters of sectors, i.e. those with above the median ratio of foreign sales to total sales and those below this value. The regression line for above-median exporters is flatter than that for the below-median group, indicating a lower correlation between profit rates and the degree of market concentration. The bottom panel in Figure 4 depicts the relationship between HHI and profit margins for groups of sectors whose foreign sales to total sales ratio is above the third quartile and below the first quartile of the distribution of foreign sales to total sales ratio. The regression line for the above-third quartile is flatter than for the sectors that fall below the first quartile. The difference in slopes is also statistically significant at 1 percent for the specification in the bottom panel, where the difference in groups in terms of export intensity is wider. In comparison to non-tradable or relatively closed sectors, the flatter slope for the exporters may be interpreted as indicating less room for maneuver in adjusting markups and profit margins due to their exposure to fiercer competition in international markets.

These findings support Hall (2018), Syverson (2019) and Andrés et al. (2021) in that concentration may not be a good indicator of market power for some industries, depending on the extent of internal and external competitive pressures they face. Operating with low margins could be the main driving force behind seizing and maintaining higher market share in the presence of strategic competitors, where the causality runs from profits to market concentration. Conversely, in the lack of potential competitors, high concentration may allow for setting high markups. Thus, we can infer that market concentration and profits are positively linked, yet variation in profit rates cannot be attributed entirely to concentration ratios. Given the relatively weak statistical association of profit rates and market concentration in our data, the information content of the market concentration regarding pricing behavior might be limited. As a complementary exercise following Hall (2018), we also question whether the change in, rather than the

level of, market concentration is related to the change in profit rates from 2009 to 2015. While the results are not presented for the sake of simplicity, the statistical association between the two is found to be weaker or negligible, suggesting that the changing market structure in the manufacturing sector during 2009-2015 did not bring about a corresponding move in profit rates.

For our analysis, the reported disparities at the sectoral level weaken the case for the use of concentration indices and thus support the use of more direct measures of market power. Profit margins could serve as a more reliable option in the absence of a price-marginal cost gap. We recognize that this is an imperfect proxy for markup. Profit rate, defined as profits over sales, is positively related to markup, but it is also a function of capital intensity. In our empirical framework, we control for differences in capital intensity among sectors by including a complete set of industry dummy variables at 4-digit level. Additionally, we control for time variation in capital intensity to some extent using 2-digit sector and time interactions.

IV. Data and Empirical Methodology

We combine various datasets for the analysis. Our database includes (i) producer price index (PPI), industrial production index (IPI), and total value of exports and imports at the 4-digit sector level compiled by the Turkish Statistical Institute (TURKSTAT); (ii) firm and 4-digit sector level annual balance sheet and income statements compiled by the Central Bank of the Republic of Türkiye (CBRT); (iii) firm-level quarterly dataset of income statements derived from the aforementioned dataset of the CBRT for the period 2010Q1-2021Q2, which we aggregate at 4-digit sector level; (iv) firm-level dataset of outstanding FX-denominated and FX-indexed loans obtained from Credit Registry of Türkiye, which matches with the firm-level dataset on the balance sheet and income statements; (iv) exchange rates provided by the CBRT; (v) import price (excluding consumption goods and gold) calculated using unit value indices and foreign trade data compiled by TURKSTAT. In the datasets, sectors are classified according to NACE Rev.2.

The sectoral accounts database of the CBRT covers balance sheets and income statements at the firm level. Annual data spans 2009-2020, whereas quarterly data, which covers only income statements, are available

for 2010Q1-2021Q2. We use quarterly data for calculating profit margins and the annual dataset on firm accounts to compute some control variables, which we explain below. We prefer to use quarterly data for the analysis as most of the pass-through occurs within the same quarter. Therefore, variations in pass-through are more likely to be spotted using higher frequency data. Our analysis covers the period 2010Q1-2021Q2 and is confined to the manufacturing sector. After filtering, we have an average of 67,247 firms per quarter.[20] We have 175 4-digit sectors and 22 2-digit parent sectors.

Table 2 presents the data descriptions and summary statistics of the variables. For price variables, we use quarterly log-differences. The PPI is available at 4-digit. Exchange rate and import price vary with respect to time only. As for the exchange rate, we use the TL price per US dollar (USD). Since we are interested in the cost channel of import prices, we adjust the total import price index by excluding gold and consumption goods (Figure 5).

Sectoral profit margins are first calculated using firm-level quarterly income statements, and then these figures are aggregated to 4-digit sector level using net sales as weights. Profit margin is defined as profits over net sales, namely the difference between net sales and cost of goods sold.

FX liability over total assets is calculated at firm level using matched datasets on outstanding loans and balance sheets. FX liability is available quarterly, and total assets are available at an annual frequency. Trade ratios are all calculated at 4-digit sector level. Other ratios related to the financial state of the sector are directly available at 4-digit level from the sectoral accounts dataset of the CBRT. Production indices at 4-digit level are directly available from TURKSTAT.

[20] At the firm level, we remove data if sales are empty or take a negative value. We trim the data based on the values of profit rates. First, by applying box plot analysis, the observations that fall more than 1.5*interquartile range (IQR) above the third quartile or 1.5*IQR below the first quartile within each 4-digit sector*date unit are excluded. Then, we leave out the top and bottom 5 percent of the remaining profit rates. We also trim the data aggregated at the 4-digit sector level. For each date, we exclude observations of the top and bottom one percentile of profit rates and net exports/total assets ratio and the top one percentile of the exports/total assets and imports/total assets ratios.

Table 3 reports the cross-correlations of the main variables, as used in the regressions. Profit margins are negatively and significantly correlated with FX indebtedness, net exports and other variables characterizing the financial position, but not correlated with import prices as preferred.

IV.i. Empirical Framework

We use 4-digit sector-level panel data to estimate the impact of profit margins on import price pass-through. Our regression specification and identification strategy are similar to those used by Fendoğlu et al. (2020). The impact variable, import price, is the price of imports expressed in domestic currency. Hereafter, import price refers to TL-denominated import price.

We test whether profit margins affect import price pass-through by estimating the following equation:

$$\Delta lnPPI_{i,t} = \delta_i + \beta_{IPTL}\left(profit\ margin_{i,t-4} \times \Delta lnIPTL_t\right) + \gamma_{j,t} + Controls_{i,t-4} + \alpha\ \Delta ln(Indust.Prod.)_{i,t} + \varepsilon_{it} \quad (1)$$

where i, j, and t represent 4-digit sectors, 2-digit parent sector, and time respectively. The dependent variable, $\Delta lnPPI_{i,t}$ denotes the quarterly logarithmic difference of PPI in 4-digit sector i at time t. $\Delta lnIPTL_t$ is the quarterly logarithmic difference of the import price index expressed in TL, where $IPTL_t$ is import prices in TL. The independent variable of interest is the interaction of $\Delta lnIPTL_t$ with $profit\ margin_{i,t-4}$, which is averaged over the last four quarters due to seasonality concerns. A positive estimate for β_{IPTL} indicates that higher markups increase the pass-through of import prices. Variable δ_i is the sectoral time-invariant factor. γ_{jt} is the time-variant characteristics at the parent sector's level, enabling us to control for any supply and demand shock common to the firms operating under the same parent sector. $Controls_{i,t-4}$ is a vector of sector-specific variables that characterize FX and foreign price exposure as well as financial structure. These cover exposure through exports, intermediate import use, import competition, and FX indebtedness. The ratios of exports, imports, and net exports over total assets are used to control foreign trade linkages. We use FX liability over total assets as an indicator of FX

indebtedness. Other controls for financial position include acid-test ratio, inventory turnover, total assets turnover, and receivables turnover. Similar to the main variable of interest, we use fourth lag of these control variables in interaction with $\Delta lnIPTL_t$. Finally, we use the log-difference of the 4-digit IPI to control for the state of economic activity. We estimate equation (1) using weighted least squares, where the weights are the time-averages of the sectoral shares within the PPI. The sample period for the estimation is 2010q1-2021q2.

One empirical concern about this estimation might be the endogeneity of profit margins to import prices, since there is a feedback mechanism between the two. As we already discussed, firms' price response to cost shocks depends on many factors such as the source and persistence of the shock as well as the strategic interactions among the competitors. Hence, markups are variable, and firms adjust them strategically in response to cost shocks. It has been documented that high-performance exporters react to real exchange rate depreciations more by increasing their markups and less by increasing their export volume. Berman et. al (2012) and Caselli et. al. (2017) provide evidence for this at the product level, showing that exporters' markup response to real depreciation is greater for products with higher productivity. As mentioned earlier, profit margins respond positively to exchange rates in Türkiye as well (Torağanlı, 2010; Gürcihan-Yüncüler and Oral, 2018). Another source of endogeneity could be that markups also respond to expected inflation, which might be strongly correlated with current inflation. Glower et. al (2023) present evidence on how markups rise when firms expect higher marginal costs in the future and want to smooth out price increases over time. In order to deal with this potential endogeneity issue, we use sufficiently distant lags of profit margins and other control variables that interact with import prices. To check the robustness of the findings, we also estimate the same specification using time-invariant profit margins. In these latter estimations, we use average profit margins for the initial period of the sample (2010-2012), where the profit margins appear to be rather stable (Figure 1).

V. Results

We start this section by documenting the magnitude of the average import price pass-through in the manufacturing sector during the span of our analysis. Table 4 reports the results of this simple regression which only includes sector fixed effects along with the current and lagged values of $\Delta lnIPTL_t$. Accordingly, a 10 percent rise in import price increases producer prices by 3.55 percent in the first quarter and by 0.95 percent in the second quarter (Model 1). In the second column, we estimate the pass-through rates separately for USD-denominated import price and the exchange rate. Similar to the findings of Yüncüler (2011), cumulative pass-through rates of US dollar-denominated import price and the exchange rate are close in magnitude, around 45 percent (Model 2).

We extend the model in the first column (Table 4, Model 1) by estimating sector specific pass-through rates. Figure 6 displays the histogram of sector-specific pass-through coefficients, i.e. the sum of the coefficients of the interactions of $\Delta lnIPTL_t$ and $\Delta lnIPTL_{t-1}$with 4-digit sector dummy variables. There appears a significant degree of heterogeneity in pass-through rates across sectors. In response to a 10 percent increase in import prices, the first and third quartile values of the pass-through rates are estimated as 2.2 percent and 4.7 percent, respectively. We should also note that some part of this sectoral variation in pass-through might stem from using the total import price index in the analysis rather than using 4-digit indices due to data limitations.

Table 5 presents our main results. Model 0 documents the magnitude of markup-linked pass-through excluding time-varying fixed effects. This specification is compatible with the raw models in Table 4. Our prior is that the estimated coefficient of $\Delta lnIPTL_t$ will be greater than 0.45, the average pass-through estimate of raw models, if profit margins limit the pass-through on prices. The estimation results validate this prior as we find the cost-cushioning impact of profit margins to be significant. Model 0 shows that a 10 percent increase in import prices would increase producer prices by 6.4 percent, rather than 4.5 percent, for a zero-profit industry. For the mean profit rate of 0.18, import price pass-through is 0.34,

rather than the zero-profit benchmark of 0.64, thus the markup effect reduces the pass-through rate by about half.[21] In other words, the zero-profit pass-through is estimated as 64 percent, whereas the mean-profit pass-through reduces to 34 percent. Model 1 in the second column includes the main variable of interest and basic controls. In the latter specifications, we extend this basic setup by adding interactions representing other channels through which import price pass-through is affected. These interactions and the other control variables are added one at a time. Model 2 shows the impact of balance sheet channel through the inclusion of FX leverage interaction. Models 3 and 4 control for trade channels, where the former includes net exports, and the latter covers exports and imports separately. Finally, model 5 contains the other sectoral controls for the financial position, along with the balance sheet and trade channels. All the models include quarterly log-difference of the 4-digit IPI to control for the state of economic activity.

The coefficient estimate for the interaction of profit margins with $\Delta lnIPTL_t$ is negative and significantly different from zero under all specifications. In the final specification, which includes all interactions and controls, β_{IPTL} takes the value of -1.44. In response to a 10 percent increase in import prices, the pass-through rate is lower by 0.144 percentage points when profit margins are higher by 1 percentage point. To make a more detailed inference, we provide an additional quantitative assessment of the economic importance of our variable of interest. We present the change in import price pass-through in response to a 10 percent increase in import prices when the profit margin is at the 10th, 50th, and 90th percentiles (Table 5, bottom panel). The impact on import price pass-through is -1.5 percentage points at the 10th percentile and goes to -3.9 percentage points at the 90th percentile. At the median profit margin, pass-through is lower by 2.5 percentage points in response to a 10 percent rise in import price. Considering that the pass-through rate under zero-profit rate is 6.4 percent, the impact coming from profit margins is sizable. The results provide evidence in support of the theoretical explanations that stress the cost-shock absorption

[21] To get this figure, we multiply the mean profit rate with the coefficient reflecting the markup effect and divide this sum by the overall (zero profit) pass-through rate, i.e. (1.66*0.18/0.64). Coefficient estimates are based on Model 0 in Table 5.

capacity of markups. Higher markups foster a cost-absorbing role to cushion shocks and reduce price response.

For a robustness check, we also used an alternative measure of market power, along with profit rates, by running the models with the interactions of concentration indicators. These interactions are positive and significant if we leave out trade and balance sheet channels of pass-through (Table A.1). Once these controls are included, market concentration measures are no longer significant. Torun and Yassa (2023) used data on the domestic producer prices in Türkiye to study the association between market concentration and inflation. Their results attribute more significance to market concentration in explaining inflation compared to our findings. They conclude that the industries with high market concentration have higher annual producer price inflation on average than those that are characterized with low market concentration.[22]

As a further robustness check on the potential endogeneity problem, we ran the same regressions in Table 5 by replacing lagged time-varying sectoral profit margins with average profit margin of each sector over the period 2010-2012. We estimate the models for the period after 2012. As shown in Table A.2, the results remain intact.

Our results are consistent with the earlier literature on the determinants of pass-through in Türkiye: FX debt increases import price pass-through, and net exporter status reduces pass-through. Ertuğ et al. (2020) reveal that there is a considerable degree of heterogeneity across industrial sectors in terms of the pass-through of shocks to exchange rate and import price in US dollars. Higher reliance on imported inputs increases exchange rate pass-through. Net FX position, covering FX debt and net exports, mitigates exchange rate pass-through (Fendoğlu et al., 2020; Ertuğ et al., 2020). Given the significant negative correlation between net exports and profit margins presented in Table 3, controlling for net exports mildly

[22] The span of our analysis overlaps with that of Torun and Yassa (2023), while different data frequency, and a different set of controls may explain the difference in results.

increases the cushioning effect of profit margins in Models 3 and 4. At this point, it is worth noting that the role of the net export position of a firm in cost pass-through is not driven by the impact of imports alone. While higher import intensity increases pass-through, higher reliance on exports reduces it, as demonstrated in Model 4. The amplifying impact of import intensity on pass-through reflects the cost channel. On the other hand, the mitigating role of export share on pass-through is associated with the buffer role of profits, driven by the markup channel. Export share-induced markup channel is the subject of the vast literature on variable markups and incomplete pass-through of exchange rates on export prices.[23] Accordingly, in response to a depreciation in the domestic currency, a higher export share is associated with higher markups and lower pass-through on FX-denominated export prices. While the direct focus of this literature is on exchange rate pass-through on FX-denominated prices rather than domestic prices, our results suggest that the markup channel may also have implications for the latter. Considering the earlier findings on the low pass-through of exchange rate on FX-denominated export prices in Türkiye, we can argue that the firms benefiting from a rise in their profits after domestic currency depreciations might have less incentive to raise their domestic prices compared to non-exporter firms.[24] Our findings also imply that the cost channel (import intensity) and the export share-induced markup channel are almost equally important for their impact on import price pass-through. The effects of 1 percent higher import and export shares on pass-through nearly cancel out each other. Hence only net exporters have a lower degree of cost pass-through.

[23] Amiti et. al. (2014), Devereux et al. (2017).

[24] See Akgündüz et al. (2019), and Aydın and Gül (2020) for empirical evidence on the incomplete pass-through of the exchange rate to export prices in Türkiye. In line with these findings, Gürcihan-Yüncüler and Oral (2018) and Demiroğlu (2019) show the rise in profitability of exporters following a depreciation in the TL.

VI. Conclusion

In this paper, we investigate the impact of market power on cost pass-through to producer prices for the manufacturing industry in Türkiye. As a first step, we focus on choosing an appropriate proxy for market power by examining the link between market concentration and profit margins. We document that: (i) concentration rates and profit margins are positively, but weakly correlated, (ii) the correlation is lower for export-oriented sectors, (iii) it ranges from 10 percent to 30 percent over time, (iv) the link between the levels of concentration and profit rates displays significant heterogeneity across sectors, (v) the statistical association between the changes in these two indicators is negligible. In short, our analyses imply that market concentration and profits are positively related, yet market power, implied by profit rates, can only partially be attributed to concentration ratios. Hence, market power is proxied by profit margins instead of concentration measures in the baseline analysis, while the latter's significance is tested as a robustness check.

Our analysis spans the period 2010Q1-2021Q2. We use TL-denominated import prices as our cost measure. There are two reasons behind this choice: First, material costs are the major component of total cost in the manufacturing sector, and second, exchange rate and FX-denominated import price shocks are the most frequently observed shocks. These two factors facilitate a clear empirical identification. Our results confirm earlier findings in the literature that higher exports net of imports reduce cost-pass-through, while FX indebtedness increases pass-through. Controlling for trade and balance sheet channels, higher profit margins significantly reduce cost pass-through. Regarding empirical results of the encompassing model with all interactions and controls, median-profit margin cost pass-through is estimated to be lower by 2.5 percentage points, in response to a 10 percent rise in import price. Hence, in comparison to the 6.4 percent zero-profit pass-through, the cost-cushioning role of profit margins is found to be quite significant. On the other hand, we find the standard market concentration measures to be insignificant, when used with control variables representing other channels of pass-through.

All in all, we provide evidence that higher profit margins are associated with lower response of prices to cost shocks in the manufacturing industry. From a policymaking perspective, these results highlight another aspect of inflation dynamics in Türkiye, apart from the well-documented main drivers of inflation. Our findings on the significance of the negative association between profits and cost pass-through into prices point out a potential role for structural policies on inflation stabilization. Structural reforms, complementing a prudent and disciplined monetary and fiscal framework, may contribute to maintaining price stability by promoting productivity enhancement at the micro level. From this point of view, this paper not only contributes to the understanding of inflation dynamics in Türkiye, but also sheds light on the extent of the potential gains from improving cost-efficiency and productivity through structural policies. Further research is needed to reveal sectoral heterogeneities in cost pass-through with respect to market structure, particularly regarding varying degrees of internal and external competitive pressures at firm/sector level.

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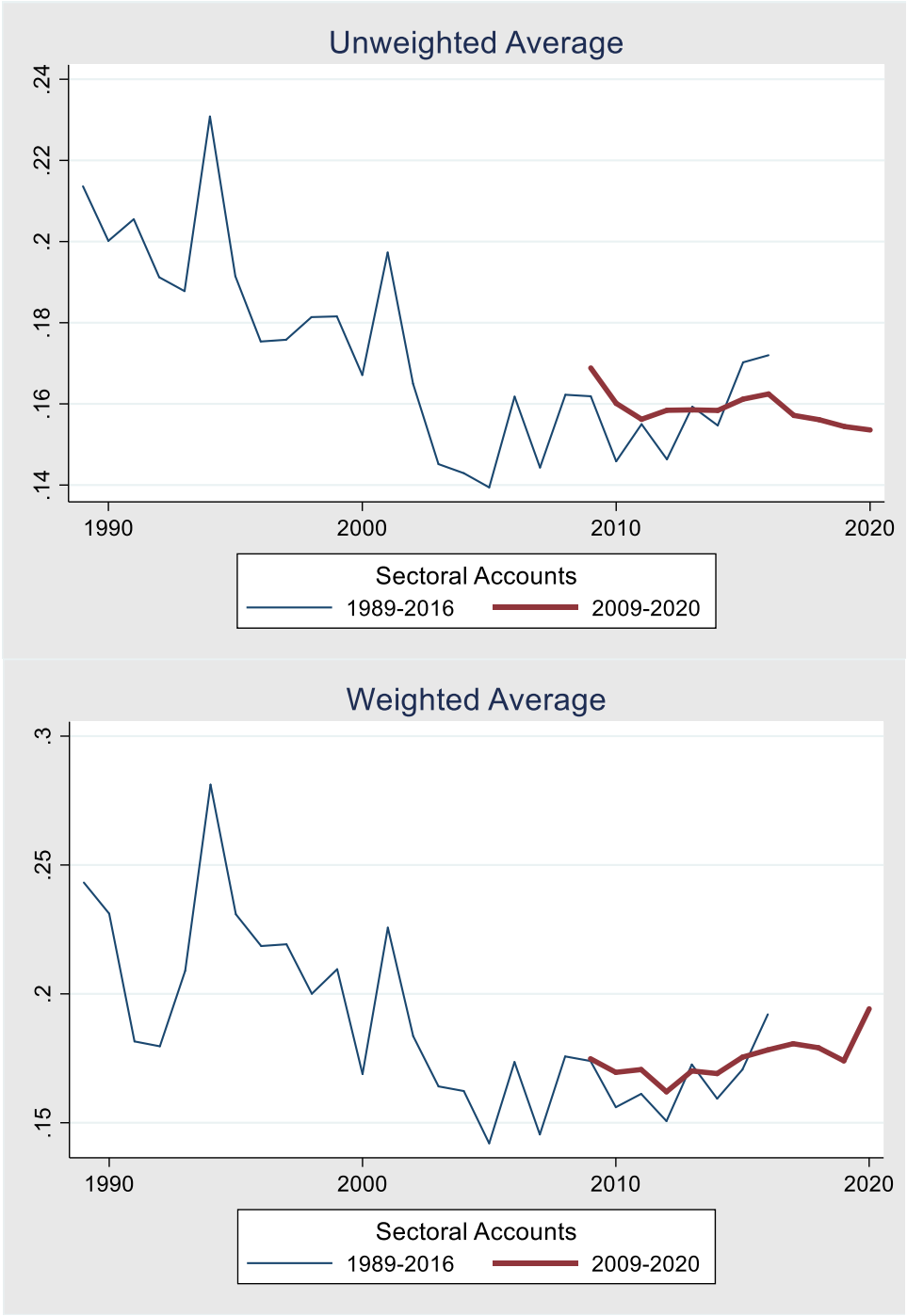
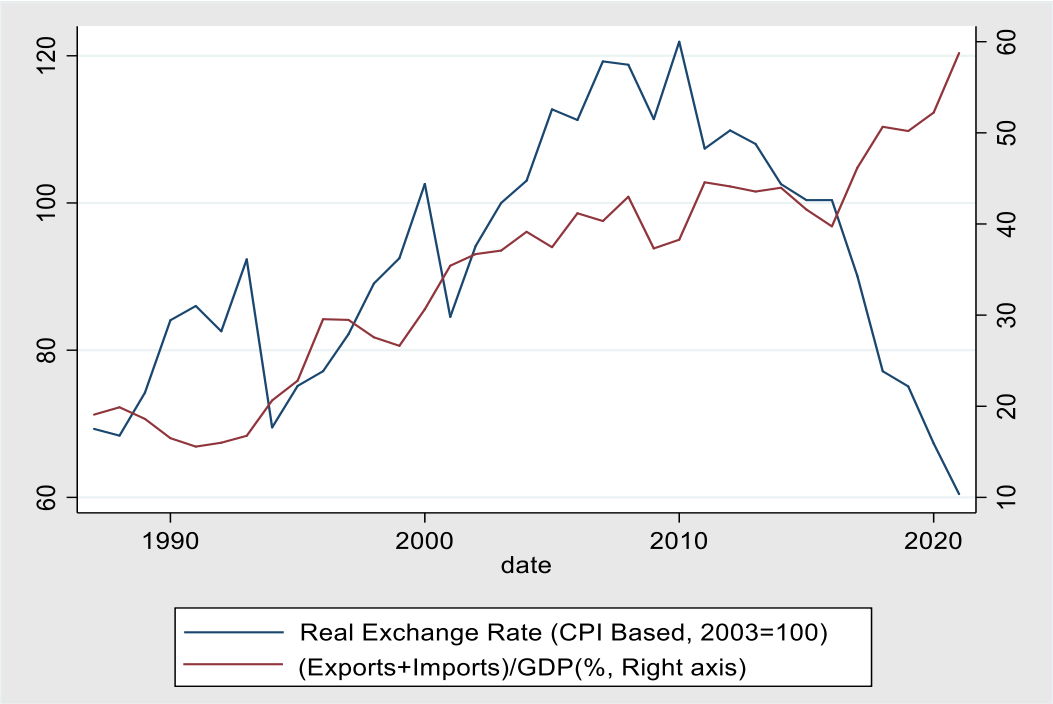
Figures and Tables

Figure 1. Profit Margins in the Manufacturing Sector 1996-2020 (%)



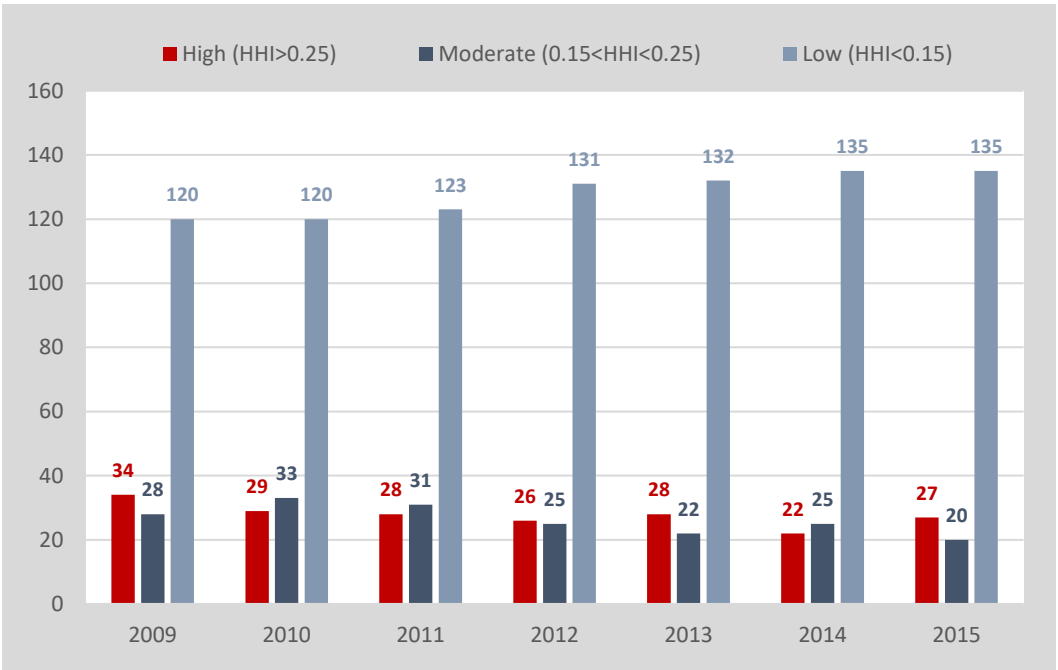
Source: Authors' calculations, Sectoral Accounts Database of the CBRT.
Note: Profit margin is defined as profits (net sales - the cost of goods sold) over net sales. Sectoral Accounts Database 1989-2016 is more volatile than the 2009-2020 database due to the small sample size. Sectoral Accounts Database 1989-2016 covers less than 5,000 firms per year. 2009-2020 database is enriched with administrative datasets, and it covers around 70,000 firms per year on average. The top panel displays the raw median value of the 4-digit sectoral profit margins. The bottom panel displays the weighted median of the 4-digit sectoral profit margins, where weights are given by sectoral shares in total sales.

Figure 2. Real Exchange Rate and Trade Openness (%)



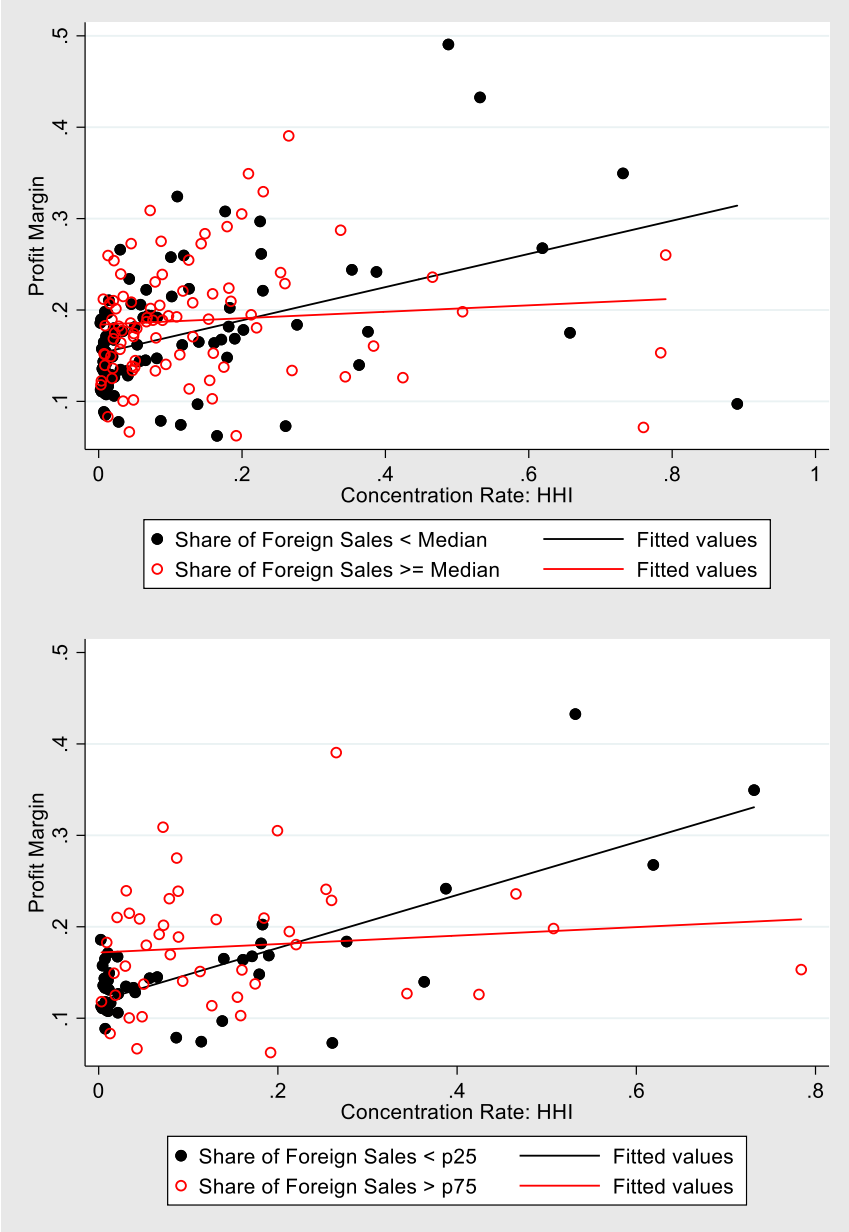
Source: CBRT, TURKSTAT.
Note: An increase in the real exchange rate corresponds to an appreciation.

Figure 3. Market Concentration in the Manufacturing Industry
(Number of Sectors by HHI)



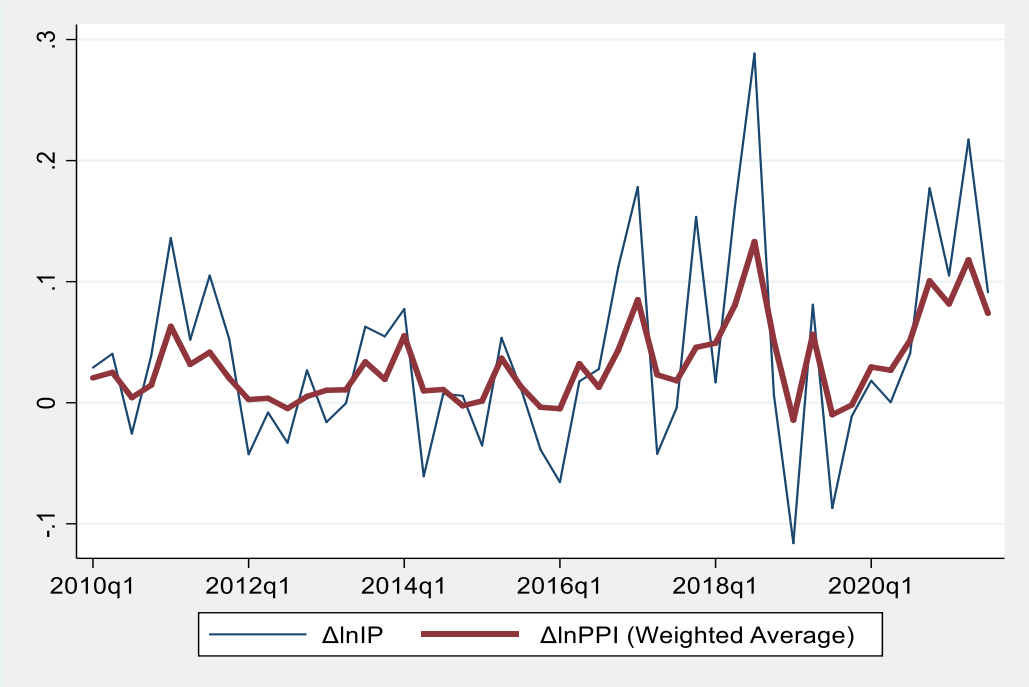
Source: TURKSTAT.

Figure 4. Association between HHI and Profit Margins: Variation with respect to Exporter Status at 4-digit Sector Level



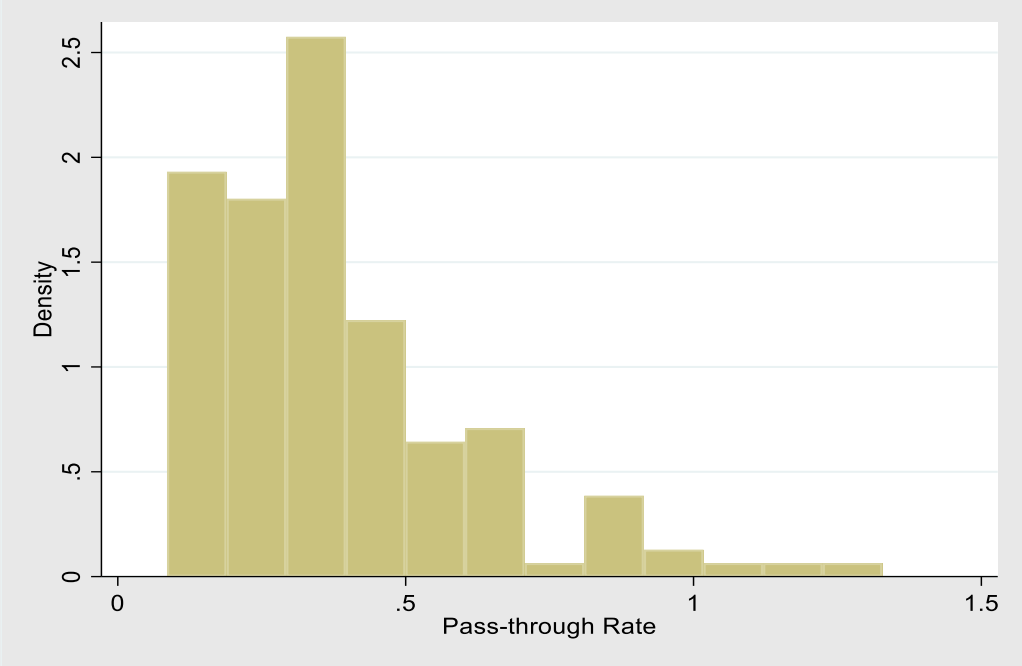
Source: Authors' calculations.
Note: The figure displays a scatter plot of concentration rates (HHI) and profit margins for groups of sectors that show variation with respect to export intensity. Profit margins and share of foreign sales are the averages over the period 2010-2021, HHI are the averages over the period 2010-2015. In the top panel, we partition the sectors with reference to the median of the ratio of foreign sales to total sales. This ratio's first and third quartiles are cutoff points in the bottom panel. Based on visual inspection, the correlation between HHI and profit rates is lower for the sectors with low export intensity than those with high export intensity. The difference in correlations between these sectors is significant at 1% for the specification in the bottom panel, where we compare sectors situated at the bottom and top tails of the distribution of export intensity. We test the significance of the difference in slopes using a regression analysis. Results are available upon request.

Figure 5. Import Prices and PPI (Quarterly Log Difference)



Source: CBRT, TURKSTAT.

Figure 6. Distribution of Import Price Pass-through at 4-Digit Sector Level



Source: CBRT, TURKSTAT.
Note: Pass-through to producer prices in response to one percentage points increase in TL-denominated import prices.

Table 1. Correlation Matrix for Market Concentration and Profit

	2009				2010				2011				2012			
	CR4	CR8	HHI	Profit	CR4	CR8	HHI	Profit	CR4	CR8	HHI	Profit	CR4	CR8	HHI	Profit
CR4	1				1				1				1			
CR8	0.97	1			0.98	1			0.98	1			0.98	1		
HHI	0.85	0.76	1		0.83	0.75	1		0.82	0.73	1		0.84	0.76	1	
Profit	0.24	0.26	0.18	1	0.30	0.32	0.27	1	0.27	0.28	0.19	1	0.18	0.19	0.10	1
	2013				2014				2015							
	CR4	CR8	HHI	Profit	CR4	CR8	HHI	Profit	CR4	CR8	HHI	Profit				
CR4	1				1				1							
CR8	0.98	1			0.97	1			0.98	1						
HHI	0.83	0.75	1		0.86	0.77	1		0.86	0.78	1					
Profit	0.26	0.25	0.15	1	0.20	0.21	0.12	1	0.29	0.29	0.20	1				

Source: Authors' calculations, Sectoral Accounts Database of the CBRT, TURKSTAT.

Note: CR4: The market share of the first four largest firms in the corresponding industry at the 4-digit level. CR8: The market share of the first eight largest firms in the corresponding industry at the 4-digit level. HHI: Herfindahl–Hirschman Index, calculated by the sum of squared market shares of each firm in the corresponding industry at the 4-digit level, divided by 10,000.

Table 2. Data Descriptions and Summary Statistics

		Descriptive Statistics						
Variable	***Description***	***Mean***	***St. dev.***	***P10***	***P25***	***Median***	***p75***	***p90***
$\Delta lnPPI_{i,t}$	Log difference of PPI of sector *i* from quarter t to t-1	0.031	0.049	-0.011	0.004	0.022	0.051	0.089
$\Delta lnER_t$	Log difference of TL/USD from quarter t to t-1	0.042	0.061	-0.029	-0.005	0.030	0.083	0.119
$\Delta lnIP_t$	Log difference of import prices (excluding consumption and gold) from quarter t to t-1.	-0.001	0.055	-0.059	-0.032	-0.009	0.027	0.060
$\Delta lnIPTL_t$	Log difference of TL denominated import prices (excluding consumption and gold) from quarter t to t-1.	0.040	0.084	-0.043	-0.011	0.018	0.081	0.163
$\Delta lnIPI_t$	Log difference of industrial production index at the 4-digit sector level from quarter t to t-1.	0.015	0.096	-0.072	-0.024	0.015	0.053	0.102
Profit $Margin_{i,t}$	Profits expressed as a percentage of net sales. Sectoral figures are averages of gross margins calculated at the firm level.	0.180	0.072	0.101	0.132	0.171	0.215	0.270
FX Liability/Total $Assets_{i,t}$	Calculated at the firm level using matched data from outstanding loans data from the Credit Registry and the balance sheet dataset of the CBRT. Sectoral figures are sectoral averages over firms.	0.204	0.216	0.000	0.025	0.135	0.324	0.511
$Exports_{i,t}$/Total $Assets_{i,t}$	TL value of exports available at the 4-digit sector level is divided by the total assets in that sector. This ratio is calculated at the sector level.	0.437	1.024	0.023	0.060	0.129	0.306	0.816
$Imports_{i,t}$/Total $Assets_{i,t}$	TL value of imports available at the 4-digit sector level is divided by the total assets in that sector. This ratio is calculated at the sector level.	0.465	1.029	0.007	0.034	0.118	0.351	1.122
Net $Exports_{i,t}$/Total $Assets_{i,t}$	TL value of net exports available at the 4-digit sector level is divided by the total assets in that sector. This ratio is calculated at the sector level.	-0.044	0.785	-0.439	-0.108	0.010	0.087	0.295
Acid-Test $Ratio_{i,t}$	Calculated as Current Assets-Inventories- Prepaid Expenses-Other Current Assets/Short-Term Liabilities. Directly available at the 4-digit sector level.	0.654	0.152	0.434	0.556	0.674	0.761	0.829
Inventory $Turnover_{i,t}$	Calculated as Cost of Goods Sold/Current Year's Inventories+ Previous Year's Inventories. Directly available at the 4-digit sector level.	3.447	1.237	1.756	2.612	3.386	4.175	5.107
Total Assets $Turnover_{i,t}$	Calculated as Net Sales/Total Assets. Directly available at the 4-digit sector level.	0.914	0.190	0.675	0.784	0.907	1.029	1.152
Receivables $Turnover_{i,t}$	Calculated as Net Sales/Short-Term and Long-Term Trade Receivables. Directly available at the 4-digit sector level.	3.717	0.848	2.839	3.228	3.619	4.042	4.613

Note: Descriptive statistics are calculated for the period 2011Q1-2021Q2.

Table 3. Summary Statistics: Cross Correlations

	ΔlnPPI	ΔlnIP	ΔlnER	ΔlnIPTL	Profit Margin	FX Liability/ Total Assets	Exports/ Total Assets	Imports/Total Assets	Net Exports/ Total Assets	Total Assets Turnover	Receivables Turnover	Acid-Test Ratio	Inventory Turnover	ΔlnIPI)
ΔlnPPI	1													
ΔlnIP	0.3123*	1												
ΔlnER	0.3793*	0.0433*	1											
ΔlnIPTL	0.4807*	0.6849*	0.7576*	1										
Profit Margin	-0.004	0.023	0.007	0.020	1									
FX Liability/Total Assets	0.0504*	-0.016	0.020	0.005	-0.0320*	1								
Exports/Total Assets	0.007	-0.013	-0.001	-0.010	-0.1861*	0.1290*	1							
Imports/Total Assets	0.0360*	-0.011	-0.004	-0.011	-0.0425*	0.1228*	0.6323*	1						
Net Exports/Total Assets	-0.0432*	-0.007	0.002	-0.003	-0.1395*	0.016	0.3047*	-0.4741*	1					
Total Assets Turnover	-0.0650*	-0.0857*	-0.0651*	-0.1036*	-0.2251*	-0.007	0.1556*	0.1836*	-0.0780*	1				
Receivables Turnover	-0.0740*	-0.0558*	-0.0585*	-0.0792*	-0.2373*	0.0483*	0.023	0.011	0.015	0.5096*	1			
Acid-Test Ratio	0.0411*	0.019	0.023	0.0288*	0.0996*	0.003	0.1092*	0.2746*	-0.2332*	0.4621*	-0.1606*	1		
Inventory Turnover	-0.004	-0.0357*	-0.0308*	-0.0459*	-0.1718*	0.0690*	0.0819*	0.1669*	-0.1561*	0.7465*	0.2953*	0.6056*	1	
ΔlnIPI	-0.0877*	0.1263*	-0.0407*	0.0528*	0.0021	-0.0111	0.004	0.0038	0.0019	0.0163	0.0064	0.0256*	0.0092	1

Note: Descriptive statistics are calculated for the period 2011Q1-2021Q2. Variables are transformed in the way used in estimations. * p<0.05.

Table 4. Overall Pass-through of Import Prices

	Model 1	Model 2
Dep. Variable	$\Delta \ln PPI_{,t}$	
$\Delta \ln IPTL_t$	0.355***	
	(0.0183)	
$\Delta \ln IPTL_{t-1}$	0.0950***	
	(0.0159)	
$\Delta \ln IP_t$		0.382***
		(0.0387)
$\Delta \ln IP_{t-1}$		0.0621*
		(0.0363)
$\Delta \ln ER\_USD_t$		0.348***
		(0.0247)
$\Delta \ln ER\_USD_{t-1}$		0.108***
		(0.0231)
Number of Observations	6,870	6,870
R-squared	0.308	0.309
4-Digit Sector Fixed Effects	Y	Y

Note: Estimation period 2011Q1-2021Q2.

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

Table 5. Estimation Results

	Model 0	Model 1	Model 2	Model 3	Model 4	Model 5
Dep. Variable				$\Delta \ln PPI_{,t}$		
$\Delta \ln IPTL_t$	0.638***					
	(0.0586)					
$\Delta \ln IPTL_t$*profit margin$_{i,t-4}$	-1.664***	-0.958***	-0.995***	-1.061***	-1.065***	-1.443***
	(0.288)	(0.160)	(0.158)	(0.192)	(0.192)	(0.184)
$\Delta \ln IPTL_t$*(FX Liability/Total Assets)$_{i,t-4}$			0.214***	0.195***	0.195***	0.200***
			(0.0429)	(0.0463)	(0.0464)	(0.0452)
$\Delta \ln IPTL_t$*Net Exports $_{i,t-4}$/Total Assets $_{i,t-4}$				-0.0798***		-0.0850***
				(0.0162)		(0.0190)
$\Delta \ln IPTL_t$*Exports $_{i,t-4}$/Total Assets $_{i,t-4}$					-0.0697***	
					(0.0168)	
$\Delta \ln IPTL_t$*Imports $_{i,t-4}$/Total Assets $_{i,t-4}$					0.0786***	
					(0.0148)	
$\Delta \ln IPI_{i,t}$	-0.0419**	-0.0753***	-0.0787***	-0.0807***	-0.0804***	-0.0838***
	(0.0206)	(0.0117)	(0.0113)	(0.0123)	(0.0123)	(0.0121)
Number of Observations	6,178	6,178	6,123	5,244	5,257	4,885
R-squared	0.322	0.762	0.767	0.673	0.672	0.744
4-Digit Sector Fixed Effects	Y	Y	Y	Y	Y	Y
2 Digit Industry Fixed Effects* Time Fixed Effects		Y	Y	Y	Y	Y
Other Controls						Y
	Quantification: change in the effect of IPTL (10% increase) due to profit margins, for					
Profit Margin at 10th percentile, median and 90th percentile	-1.7, -2.8 and -4.5	-1.0, -1.6 and -2.6	-1.0, -1.7 and -2.7	-1.1, -1.8 and -2.9	-1.1, -1.8 and -2.9	-1.5, -2.5 and -3.9

Note: Other controls include 4 quarter lagged values of the acid-test ratio, inventory turnover rate, total assets turnover rate, and receivables turnover rate in interaction with the change in import prices. Models are estimated for the period 2010Ç1-2021Ç2. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Appendix

Table A.1. Estimation Results Including Concentration Rate (CR8)

VARIABLES	Model 0	Model 1	Model 2	Model 3	Model 4	Model 5
$\Delta \ln IPTL_t$	0.638***					
	(0.0586)					
$\Delta \ln IPTL_t$*profit margin$_{i,t-1}$	-1.664***	-1.070***	-1.048***	-1.137***	-1.139***	-1.426***
	(0.288)	(0.151)	(0.146)	(0.168)	(0.167)	(0.182)
$\Delta \ln IPTL_t$*CR8		0.00112**	0.000531	0.000679	0.000676	-0.000112
		(0.000436)	(0.000535)	(0.000607)	(0.000676)	(0.000423)
$\Delta \ln IPTL_t$*(FX Liability/Total Assets)$_{i,t-4}$			0.195***	0.171***	0.170***	0.204***
			(0.0531)	(0.0578)	(0.0605)	(0.0521)
$\Delta \ln IPTL_t$*Net Exports $_{i,t-4}$/Total Assets $_{i,t-4}$				-0.0797***		-0.0851***
				(0.0158)		(0.0191)
$\Delta \ln IPTL_t$*Exports $_{i,t-4}$/Total Assets $_{i,t-4}$					-0.0760***	
					(0.0191)	
$\Delta \ln IPTL_t$*Imports $_{i,t-4}$/Total Assets $_{i,t-4}$					0.0764***	
					(0.0145)	
$\Delta \ln IPI_{i,t}$	-0.0419**	-0.0758***	-0.0789***	-0.0809***	-0.0806***	-0.0838***
	(0.0206)	(0.0118)	(0.0113)	(0.0124)	(0.0123)	(0.0121)
Number of Observations	6,178	6,178	6,123	5,244	5,257	4,885
R-squared	0.322	0.763	0.767	0.673	0.673	0.744
Sector Fixed Effects	Y	Y	Y	Y	Y	Y
2 Digit Industry Fixed Effects* Time Fixed Effects		Y	Y	Y	Y	Y
Other Controls						Y

Note: Other controls include 4 quarter lagged values of the acid-test ratio, inventory turnover rate, total assets turnover rate, and receivables turnover rate in interaction with the change in import prices. CR8 is the market share of the first eight largest firms in the corresponding industry at the 4-digit level. Models are estimated for the period 2010Ç1-2021Ç2. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table A.2. Estimation Results Using Time-Invariant Profit Margins

VARIABLES	Model 0	Model 1	Model 2	Model 3	Model 4	Model 5
$\Delta lnIPTL_t$	0.695***					
	(0.0526)					
$\Delta lnIPTL_t$*profit margin$_{i,2010\text{-}2012\ avg.}$	-2.294***	-1.125***	-1.131***	-1.141***	-1.150***	-1.619***
	(0.281)	(0.148)	(0.146)	(0.192)	(0.192)	(0.197)
$\Delta lnIPTL_t$*(FX Liability/Total Assets)$_{i,t-4}$			0.188***	0.167***	0.169***	0.157***
			(0.0419)	(0.0452)	(0.0454)	(0.0431)
$\Delta lnIPTL_t$*Net Exports$_{i,t-4}$/Total Assets$_{i,t-4}$				-0.0674***		-0.0623***
				(0.0175)		(0.0201)
$\Delta lnIPTL_t$*Exports$_{i,t-4}$/Total Assets$_{i,t-4}$					-0.0553***	
					(0.0186)	
$\Delta lnIPTL_t$*Imports$_{i,t-4}$/Total Assets$_{i,t-4}$					0.0674***	
					(0.0155)	
$\Delta lnIPI_{i,t}$	-0.0399*	-0.0716***	-0.0748***	-0.0765***	-0.0761***	-0.0804***
	(0.0212)	(0.0112)	(0.0107)	(0.0117)	(0.0117)	(0.0116)
Number of Observations	5,522	5,522	5,469	4,654	4,667	4,328
R-squared	0.348	0.773	0.777	0.681	0.680	0.753
Sector Fixed Effects	Y	Y	Y	Y	Y	Y
2 Digit Industry Fixed Effects*Time Fixed Effects		Y	Y	Y	Y	Y
Other Controls						Y

Note: Other controls include 4 quarter lagged values of the acid-test ratio, inventory turnover rate, total assets turnover rate, and receivables turnover rate in interaction with the change in import prices. Models are estimated for the period 2013Ç1-2021Ç2. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

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