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FACTS ON BUSINESS DYNAMISM IN TURKEY

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Abstract

In this paper, we investigate various trends on competition and business dynamism in the Turkish manufacturing sector. More specifically, using micro level administrative data sets of firm balance sheets, credit registry and social security records, we focus on moments such as firm entry, exit, profitability, worker reallocation, labor share, labor productivity and credit distributions, among several others. Our results indicate that business dynamism in the Turkish manufacturing sector was relatively stable and even improving until 2012 but has been declining since then. We find that market concentration and exit rates have started to rise, yet new business creation, labor share of output and economic activities of young firms have declined. Using a model with endogenous market competition, we show that a adverse shock to cost of R&D investment can explain these empirical trends. We identify increases in financing costs after 2012 of followers as a potential mechanism for our findings in Turkey. We next perform a policy analysis with our model which suggests that providing support (e.g., R&D subsidy) to immediate followers can undo the adverse effects of the negative shock to financing costs and therefore foster competition and faster growth.

JEL Classification: E22, E25, L12, O31, O33, O34

Keywords: business dynamism, Market concentration, Competition, Turkish economy

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Facts on Business Dynamism in Turkey*†

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1 Introduction

A market economy consists of many firms that compete among themselves, set their prices to maximize profits, invest in new technologies to lead the market and create new jobs. Existing industrial policies shape the competition among these firms and therefore influence the resulting market concentration. What are the exact links between market concentration and business dynamism, such as firm productivity, growth, entry and exits? Which firms should be supported through industrial policies? These are just some of the key questions that need to be answered in order to inform the optimal industrial policy design. In this paper, our goal is to shed light on these important questions both theoretically and empirically, using data on Turkish manufacturing firms between 2006-2016.

Effective industrial policy design requires a good understanding of the industry and firm dynamics. As the first step, we study here manufacturing firms in Turkey and document a large number of stylized facts on market concentration, firm entry and exit, labor share, markups, and business profits. Recent literature has shown that a number of these business dynamism indicators have been declining in the US for the past 30 years (Akcigit and Ates (2019a,b), Autor et al. (2017a)). We find that business dynamism was relatively stable and even improving until 2012 in Turkey but has since then shown symptoms of decline. We establish the following facts in Turkish manufacturing sector after 2012:

Fact 1 *Average employment growth has slowed down and the unemployment rate has increased.*

Fact 2 *Market concentration has increased.*

Fact 3 *The price markups and profit share of market leaders have increased.*

Fact 4 *The average productivity of market leaders has not increased.*

Fact 5 *There is an increasing persistence among incumbent frontier firms.*

Fact 6 *Firm growth rate dispersion has declined.*

Fact 7 *Job reallocation rate among incumbents has declined.*

Fact 8 *Increase in market concentration is associated with lower labor shares.*

Fact 9 *Firm entry rate has decreased and the exit rate has increased.*

Fact 10 *Economic activity among young firms has decreased.*

Next, we use a theoretical model to operationalize these facts and understand how they might be related and what they really mean for industrial policy. Our model builds closely on the model of Akcigit and Ates (2019a), where multiple firms in each industry compete for market leadership. The price competition among firms allows the market leader to follow limit-pricing rule where the markups are determined by the technology gap between market leaders and followers. We extend our model with an adverse shock to investment costs, which can explain a decline in business dynamism similar to what we find in Turkey since 2012. More

specifically, when the followers are not able to challenge them due to higher investment costs, market leaders start to charge higher prices for the goods that they are producing and they invest less in new technologies, and hence grow more slowly. Therefore, increased market concentration leads to lower productivity growth. A policy analysis in our theoretical framework shows that industrial support (e.g., R&D subsidy) to the market followers could lower the existing market concentration, improve competition, and thus, encourage innovation.

The empirical facts about the Turkish economy suggest that the slowdown in macroeconomic performance since 2012 is led by a decline in the stable business dynamism in Turkish manufacturing. The timing in the decline of business dynamism suggests that an increase in financing costs of follower firms may be the culprit. We employ a model with endogenous market competition to perform policy exercises. The results from the model suggest that pro-competitive industrial policies that give support to immediate market followers can help them impose pressure on market leaders, make them reduce prices and force them to exert effort for new technology creation. Note that this result is about the immediate market followers, which are typically mid- to large-sized sized firms, that can apply pressure on market leaders.

The remainder of the paper is structured as follows. We first review the related literature on economic growth in Turkey and business dynamism. Section 2 introduces the administrative datasets that we use in our empirical analysis. Section 3 establishes several facts on business dynamism in Turkey. Section 4 presents a model of endogenous growth and firm competition, which allows us to better understand the mechanisms behind the empirical facts we presented. Section 5 contextualizes the empirical facts within the historical background of the Turkish economy. Section 6 concludes.

Related Literature

The slowdown in Turkish economy has generated discussion about its underlying causes in the literature. A commonly proposed cause is studied by Demiralp et al. (2016) who analyze whether the slowdown in Turkish manufacturing and growth is driven by an expansion in the construction sector. Although the authors find an increase in construction driven by public funding, they find no evidence that it led to the slowdown in economic growth. In fact, the construction sector as a share of GDP in Turkey is not particularly high compared to other emerging market economies and is below the levels seen prior to the housing bubble in advanced economies. Another explanation is proposed by Acemoglu and Ucer (2015), who argue that the deterioration in the quality of Turkish institutional landscape led to the slowdown in economic growth. However, their study does not claim to have found an empirical causal link. A third commonly proposed explanation is the risk aversion of global liquidity in the post-tapering era. Yeldan and Ünüvar (2016) argue that the difficulty in financing was particularly acute for Turkey due to its excessive external debt burden once global liquidity became more constrained due to tapering that began in May 2013.

There is no obvious answer as to which of the aforementioned arguments have the strongest

merit in explaining the slowdown of the Turkish economy. Most discussions in the literature lack micro level empirical evidence to make a causal claim and empirically establish the bottlenecks in the Turkish economy. The purpose of this paper is to diagnose the state and development of firm growth and business dynamism in Turkey within a framework set by recent literature. We follow Akcigit and Ates (2019a,b), who review the literature on the trends linked to declining business dynamism in the US and propose a theoretical framework to investigate the underlying causes behind these trends. In the current paper, we derive a number of indicators for Turkey that are used to measure business dynamism in the US literature.

The first indicator of a decline in business dynamism is an increase in market concentration which is documented in the US data (Autor et al., 2017a,b). An increase in market concentration may be attributed to a decrease in competition which in turn leads to less investment and higher profits [Gutiérrez and Philippon, 2016, 2017; Barkai, 2017; Eggertsson et al., 2018]. Indeed, mark-ups have been rising in the US [Nekarda and Ramey, 2013; De Loecker and Eeckhout, 2017; Hall, 2018]. A similar positive trend emerges in some other countries, including Turkey [De Loecker and Eeckhout, 2018; Andrews et al., 2018; Calligaris et al., 2018]. The decline in business dynamism is expected to induce a slowdown in economic activity. Some indicators of economic activity like business formation and job reallocation have decreased in the US (Decker et al., 2016a). A falling job reallocation rate leads to a reduction in new job opportunities, wage growth, job-worker match quality, and an increase in unemployment duration [see Akerlof et al., 1988; Hagedorn and Manovskii, 2013]. Davis and Haltiwanger (2014) find the same trends in some other countries and demonstrate that fluid labor markets promote wage growth and career advancement.

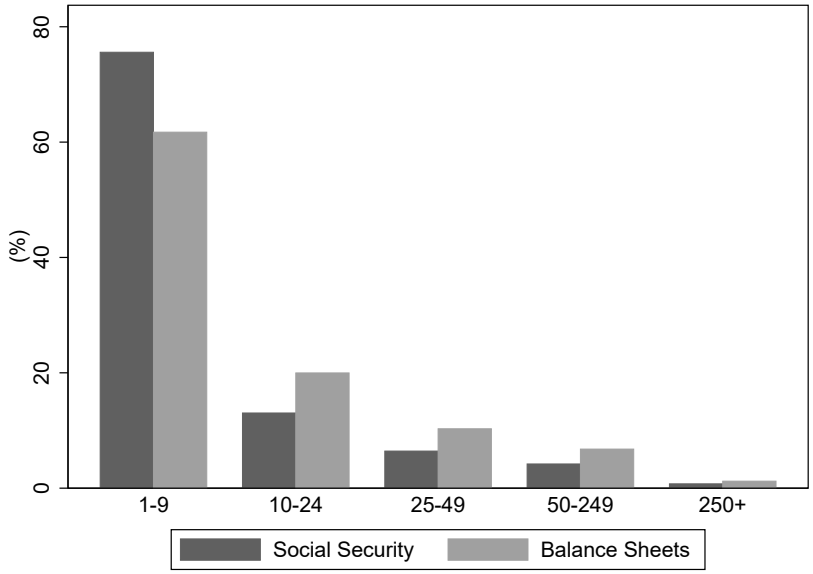
Another piece of evidence for declining business dynamism is the ongoing fall in the rate of new business formation in the U.S. [Gourio et al., 2014; Karahan et al., 2016]. The fall in entry rates along with a rising or flat exit rates has an adverse impact on labor demand and on the share of employment accounted for by young firms. Accordingly, a similar pattern is observed in the share of young firms in the US [Decker et al., 2016b; Furman and Orszag, 2018]. Young firms play a significant role in job creation (Haltiwanger et al., 2013). Criscuolo et al. (2014) and Binjens and Konings (2018) find similar trends in business formation in other countries and Bravo-Biosca et al. (2013) show that young firms make disproportionate contribution to aggregate employment growth. The reduction in young firm activity has therefore been accompanied by a decline in the dispersion of firm growth (Decker et al., 2016b). The slowdown in economic activity and dynamism further results in productivity distribution with a widening gap in productivity between frontier and laggard firms (Andrews et al., 2015, 2016).

Finally, there is a growing body of evidence that relates the increase in market concentration with a decline in the labor share of output in the US [see Autor et al., 2017a,b; Barkai, 2017; Eggertsson et al., 2018]. This decline in the labor share has also been documented globally [see Karabarbounis and Neiman, 2013; Elsby et al., 2013]. Autor et al. (2017a) find a negative correlation between market concentration and labor share at the sector level in the US data.

2 Data

Our primary data source is the Entrepreneurship Information System (EIS) made available to researchers by the Turkish Ministry of Industry and Technology. The EIS is made up of multiple administrative datasets that allows matching across datasets about different economic activities of each firm. EIS excludes the finance and public sectors in all datasets but otherwise contains administrative information on the population of Turkish firms. We use the firm registry, social security and balance sheet modules of EIS to generate the business dynamism trends of manufacturing firms in Turkey. Not all the data we use is available for all firms. In principle, the firm registry data contains all firms, whether they hire a worker (and thus included in social security) or report balance sheet (based on the tax regime). In turn, social security records are more comprehensive in coverage than balance sheets. Figure 1 presents the firm size distribution in social security data compared to the balance sheet data. The majority of the sample are small size firms employing less than 10 workers. Using social security records makes it possible to cover more small firms.

Figure 1: Firm Size Distributions



Notes: Authors' calculations from the EIS social security registry and balance sheets

Our general approach throughout the paper is to maximize the number of observations we draw to generate the facts presented in Section 3. Table 1 summarizes the variables obtained from each dataset. A brief description of each dataset, their coverage and its variables of interest is given below.

Table 1: Variables Utilized by Dataset

	Firm Registry	**Social Security**	**Balance Sheets**
		— Panel A. Variables —	
	Sector	Employment	Sales
	Age	Labor costs	Productivity
		Entry and exit	Mark-ups
		— Panel B. Number of Observations 2006-2016 —	
All firms	29,800,199	11,634,558	10,417,381
Manufacturing firms	4,025,390	2,159,498	1,604,497

2.1 Administrative Datasets

2.1.1 Firm Registry Data

All Turkish firms are included in the Firm Registry Data provided by the Revenue Administration. Since the data includes all enterprises under different tax regimes - e.g., fixed regime, small business tax regime, etc., - it includes a large number of small self-entrepreneurship enterprises with no registered employees.[1] More importantly, there is no way to ensure that all firms in the firm registry are actually economically active. Firm Registry Data contain information on the sector of firms based on NACE Rev. 2 Classification, location (city/province), the date of establishment and the start date of operations for the period 2006-2016. The sector of a firm is available at the 4-digit industry level. However, sectors vary over time, and changes may be due to firms' sector switches and data corrections. For each firm, we use the last available reported 4-digit industry to avoid unnecessary variation in sector samples.

2.1.2 Social Security Data

The Social Security Data is obtained from Social Security Institution (SSI) and integrated into the EIS. Social security records on March, June, September and December of the reference year are available from SSI for the period 2006-2016. Each month's dataset includes all registered formally employed workers in Turkey.[2] Formal employment corresponds to having a service contract in the private sector in Turkey. Self-employed, agricultural workers and public employees are not covered in the data. For each worker, we have the tax identification number of the firm employed, age, gender, net wage and the number of working days.

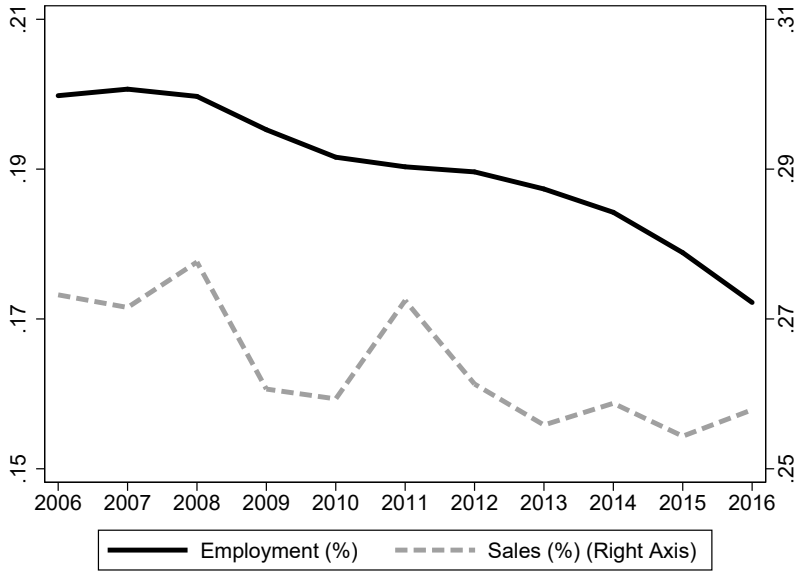
[1] See Article 178 of Tax Procedure Law No. 213 and Article 47 of Income Tax Law No. 193.

[2] The workers employed on the basis of a service contract subject to Article 4/a of the Social Security Law No. 5510.

2.1.3 Balance Sheet Data

The Revenue Administration provides the EIS with balance sheets and income statements of all Turkish firms keeping books according to balance sheet principle for the period 2006-2016. The financial and public sector are not included in the data. Incorporated firms (operating under regular corporate income tax regime - e.g., a limited company) and unlimited firms (operating under personal income tax regime - e.g., a sole proprietorship) report balance sheet and income statements for tax purposes in Turkey. The former group have to report, while the latter group only have to if they cross certain size thresholds.[3] However, some firms not meeting this requirements may voluntarily report these financial records. We keep observations with positive net sales in the data to exclude economically inactive firms. The real values of all nominal variables are obtained by deflating them using the Consumer Price Index. To understand the trends in business dynamism, we limit ourselves to the manufacturing sector, which results in a more homogenous sample where traditional definitions of productivity and growth can be used.[4] Despite the decline in the labor and sales share of manufacturing in Turkey, it covers 19% of employment and 26% of real sales of the economy on average (Figure 2).

Figure 2: Share of Manufacturing in Employment and Sales



Notes: Authors' calculations from the EIS social security registry and balance sheets

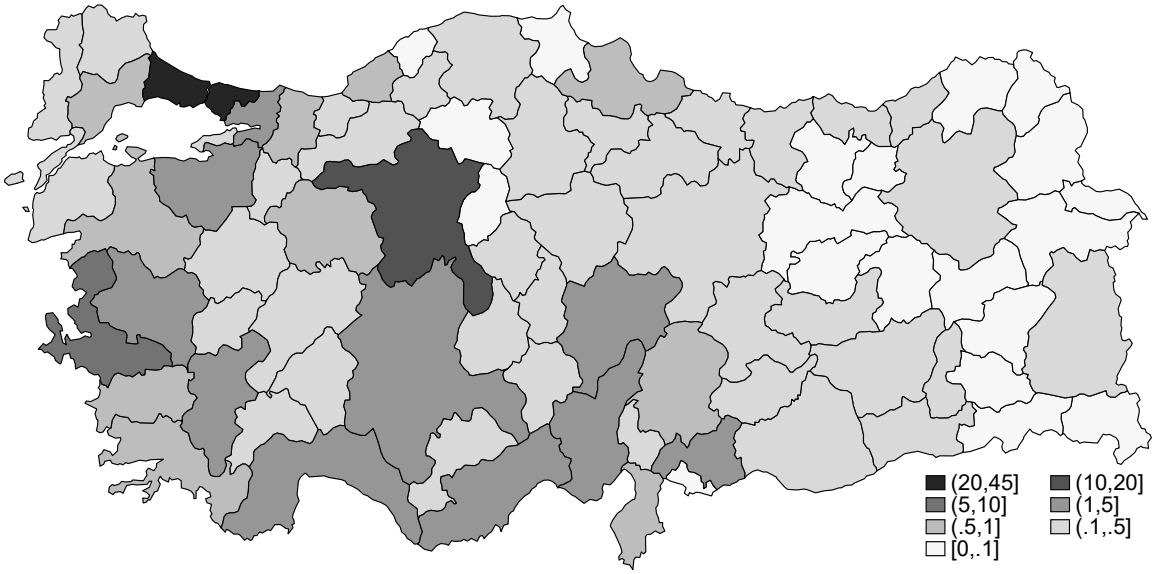
As far as the geographical distribution of activity, the EIS manufacturing data is unsurprisingly similar to the GDP distribution. Figure 3 presents the share of value added across regions at the NUTS-3 level. As we move from the east to the west of the country, economic activity increases and the biggest shares unsurprisingly belong to Istanbul and Ankara. In terms of sectors

[3] In 2016, the thresholds of the annual purchases or gross sales for the firms that sell the goods without processing or after processing were 168,000 TL and 230,000 TL, respectively. Other firms exceeding annual revenue of 90,000 TL also had to report balance sheet and income statement.

[4] We find largely similar trends in the full economy, as can be seen in the appendix Figures A1-A10.

that make up the manufacturing, the textile/clothing and the metals sectors are the most active ones in the economy.

Figure 3: Heatmap of Economic Activity (Share of Value Added)



Notes: Authors' calculations from the EIS balance sheets. The borders display the NUTS-3 level provinces of Turkey. The figure shows the share of value added by manufacturing firms with headquarters located in the province.

2.1.4 Credit Registry Data

Firm level credit data is obtained from the Credit Registry of the Turkish Banking Association which is made available to the Central Bank of the Republic of Turkey. It shows the firm-bank level links, maturity and currency denomination of the loans drawn by firms. We specifically limit the sample to manufacturing firms, which corresponds to about 34% of total credits as of 2016. We further limit the sample to incorporated firms, which covers around 90% of all credit supply. A key variable for our analysis is the currency denomination of credits which we can observe at the firm-bank level. As of December 2016, foreign currency (FX) denominated credits make-up 56.8% of all credits.

2.2 Variable Definitions

The firm registry includes both start of establishment and operation dates. In practice, these dates show discrepancies as many enterprises have earlier start of operation dates than establishment dates. Hence, for the construction of firm age, we use the later of the two dates.

We can obtain the number of employees and the wages paid in the firm for the reference period by collapsing individual level data of social security to the firm level. When calculating firm labor costs, we adjust net wages using the average social security premium of 17.5%.

To construct yearly firm entry and exit, we also use social security data. The other obvious

alternative to derive entry and exit information is the firm registry data but it does not have any information on whether the registered firms are economically active in a given year. We define entry year of a firm in social security records as the first time a firm reports an employee and assume that it exited if it ceases to report employment in the next year.

For productivity and mark-ups balance sheet data is required. We define firm productivity as the average value added per employee. Turkish balance sheets do not have material inputs as a separate item and we calculate it as the difference between the cost of sales and labor costs. Value added is then defined as the difference between net sales and the estimated material inputs.

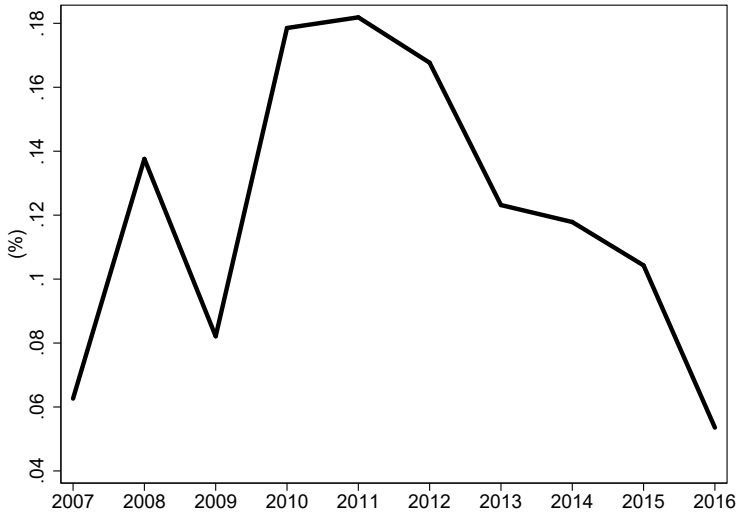
Profit shares are defined straightforwardly as the ratio of gross profits to net sales. Price cost margin is computed as the fraction of net sales left after material inputs and labor costs are subtracted. In both cases, we limit the sample to observations with an absolute value below 1 since extreme outliers which are likely to be errors in the balance sheets can lead to misleading sectoral or yearly averages.

3 Empirical Trends: Business Dynamism in Turkey

3.1 Employment performance indicators show a slowdown since 2012.

Figure 4 shows that the average (formal) employment growth of Turkish manufacturing firms dropped after 2012. The drop in 2016 is sharp, but is likely due to the shift towards informal employment following the minimum wage increase. Evidence from previous wage increases suggests that Turkish firms are likely to switch to informal employment when faced with a sharp increase in minimum wages (Gürcihan Yüncüler and Yüncüler, 2016).

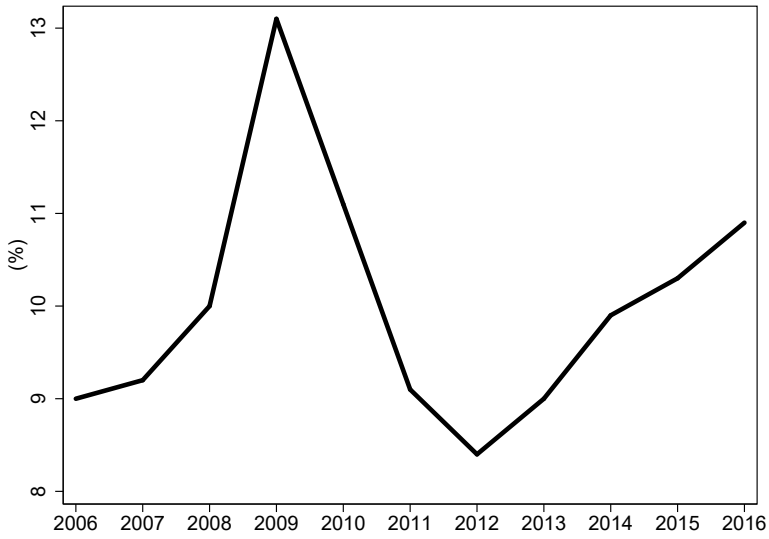
Figure 4: Mean Employment Growth



Notes: Authors' calculations from the EIS social security registry. Simple average of annual percentage change in formal employment of manufacturing firms.

In 2009, unemployment rates rose and GDP per capita growth turned negative. Nevertheless, the macroeconomic outlook rebounded between 2010 and 2012 with a particularly low unemployment rate. Finally, in the period between 2013 and 2016, unemployment rate rose steadily. To sum up, Figures 4 and 5 indicate that the Turkish economy underwent through several phases over the past decade, and the final phase after 2012 has seen decreasing employment growth and increasing unemployment rate.

Figure 5: Unemployment Rate



Notes: Annual unemployment rates obtained from Turkish Statistics for the 15+ age group.

Fact 1. *Average employment growth has slowed down since and unemployment has increased since 2012.*

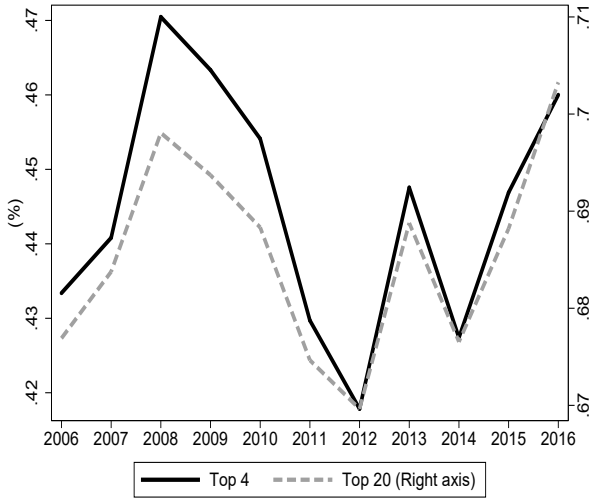
3.2 Market concentration and profits rose after 2012.

Figures 6a and 6b show three commonly used indicators of market concentration for Turkey: fraction of employees in the largest 4 firms (CR4), 20 firms (CR20) and the Herfindahl-Hirschman Index (HHI). All three indicators are calculated at the 4-digit industry level using social security records of all manufacturing firms in Turkey. Figures 6a and 6b plot the yearly mean of concentration indicators weighted by the total employment of the 4-digit industry. Market concentration in Turkey had been falling since 2009 but the trend reversed in 2012 which coincides with the slowdown in economic growth and the rise in unemployment rate.

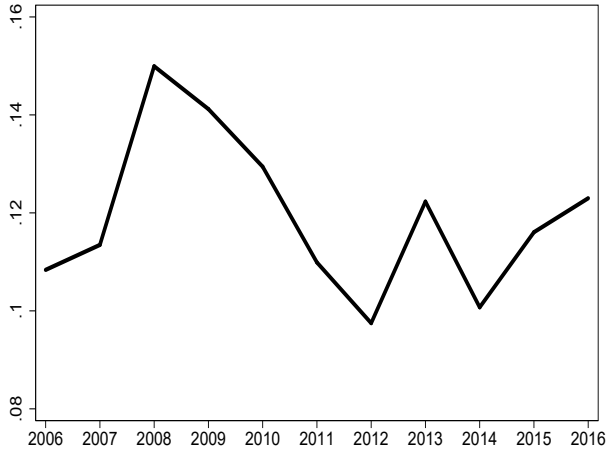
Fact 2. *Market concentration has increased since 2012.*

Figure 6: Market Concentration

a) Concentration Rate (CR4) and (CR20)



b) HH Index

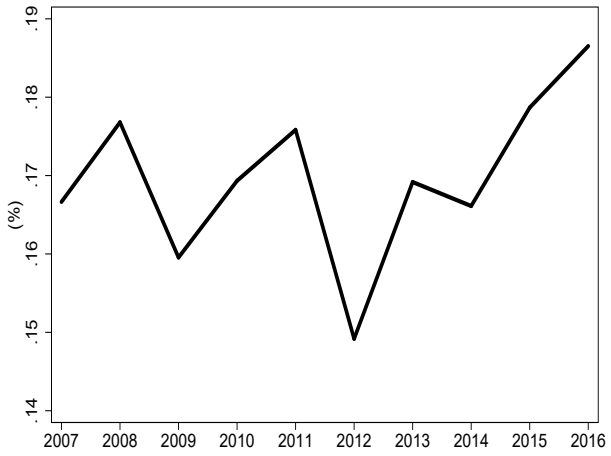


Notes: Authors' calculations from the EIS social security registry. Industry employment is used as weights. Weighted average share of employment of the largest 4 and 20 firms in a 4-digit manufacturing industry. The Herfindahl-Hirschman Index (HH Index) calculated as the sum of squared share of employment of each firm at the 4-digit manufacturing industry level and ranges between 0 and 1. The figure reports annual averages of 4-digit industry HH indexes weighted by industry employment.

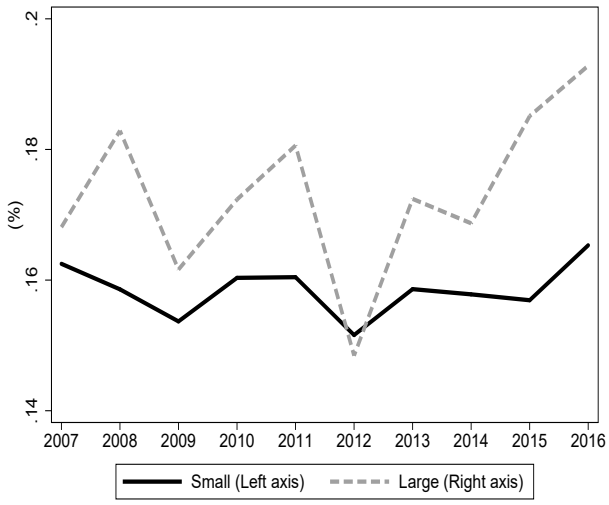
In Figures 7 and 8, we present the profit shares and price-cost margins between 2006 and 2016. Profit shares and price cost margins have begun to rise since 2012. This rise is particularly apparent in large firms which is in line with the increase in market concentration.

Figure 7: Profits

a) Average Profit Share

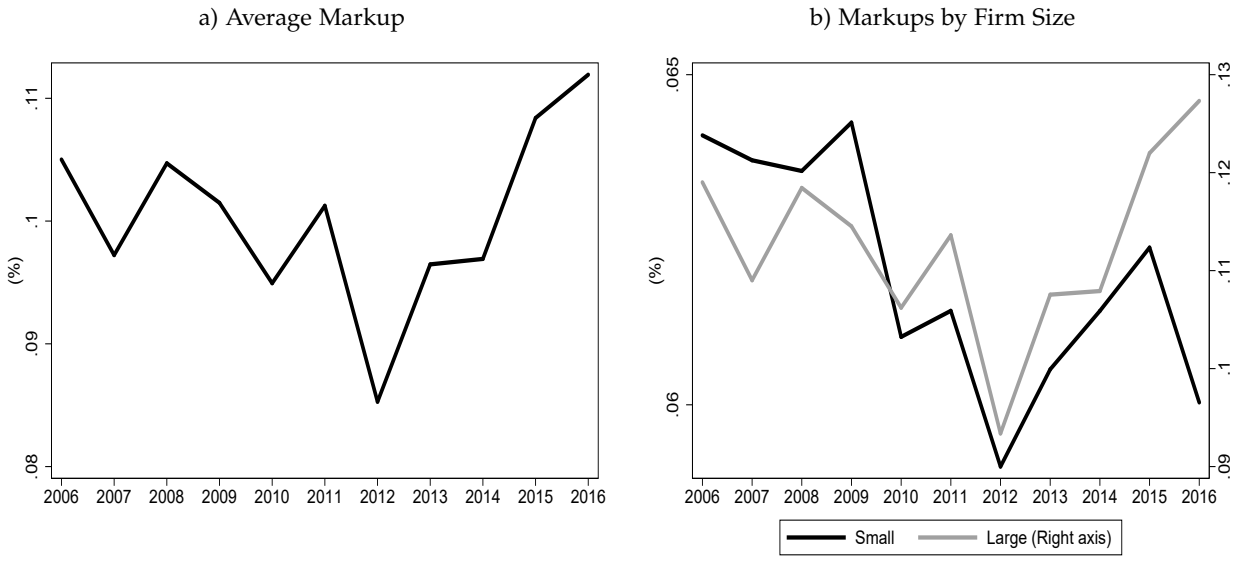


b) Profit Share by Firm Size



Notes: Authors' calculations using the EIS balance sheets. Profit share is the ratio of the sum of profits made by all manufacturing firms to the sales and change in stocks of all manufacturing firms. Small firms have fewer than 50, large firms more than 50 employees.

Figure 8: Average Markup over Time



Notes: Authors' calculations using the EIS balance sheets. The price-cost margin is calculated at the firm level as the fraction of profits in the remainder of sales after subtracting labor and material input costs. The averages reported in the figure are weighted by firm sales. Small firms have fewer than 50, large firms more than 50 employees.

Fact 3. *The price markups and profit share of market leaders have increased since 2012.*

3.3 Productivity growth of frontier firms is slower than laggard firms.

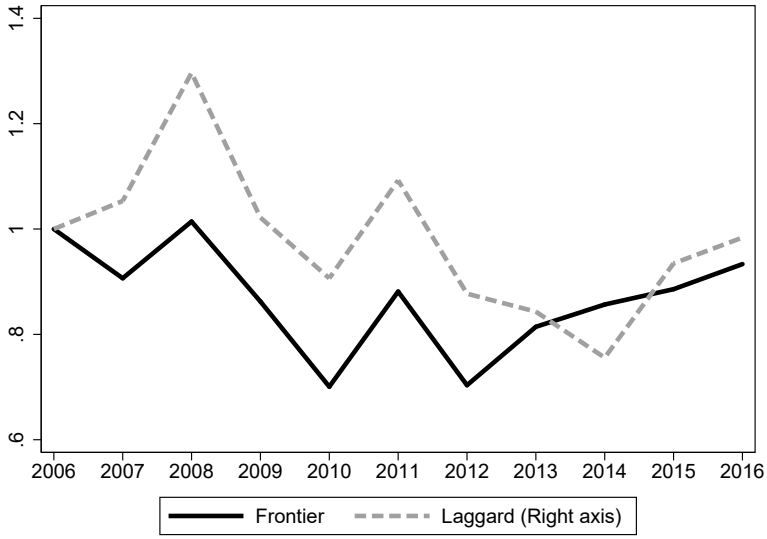
Despite the rise in market concentration and the profit shares of large firms, we find no corresponding increase in the productivity gap between frontier and laggard firms. In fact, there is evidence of a catch-up between 2006 and 2016 since laggard firms' productivity growth outpaces that of frontier firms.

Frontier and laggard firms

In defining frontier and laggard firms, we follow the classification of Andrews et al. (2016). The frontier firms are classified as the top 5% of the labor productivity distribution while the remaining 95% are the laggard firms. Unlike US based studies, we find no evidence of a widening gap between frontier and laggard firms' productivity (Figure 9). It is worth noting that small and medium sized enterprise (SME)'s productivity level is quite low, which implies that the laggard average starts in 2006 from a considerably lower base level. This group of firms may also employ a relatively larger population of informal workers which can artificially display inflated productivity levels, but we limit our sample to firms with more than 20 employees which should limit the role of informality.

Fact 4. *The average productivity of market leaders has not increased.*

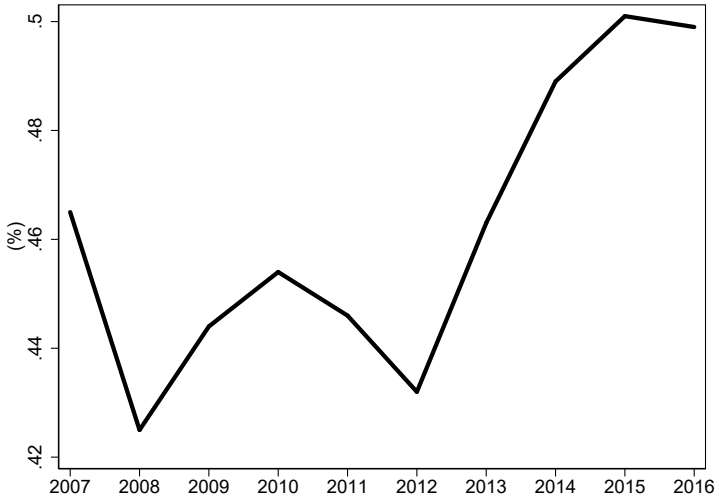
Figure 9: Labor Productivity of Frontier and Laggard Firms



Notes: Authors' calculations from the EIS balance sheets. Frontier and laggard firms are defined as the top 5% and bottom 95% of firms in the labor productivity distribution of each NACE-2 manufacturing sector. Both groups are indexed to the 2006 level. Labor productivity is the ratio of value added to employment. To avoid outliers, we exclude firms with labor productivity above the 99th percentile and below the 1st percentile within each sector-year group. Both group averages are weighted by firm value added. Similar results are found if outliers are not excluded.

Dynamism at the frontier may be observed through the persistence of incumbent frontier firms Andrews et al. (2016). Figure 10 shows the yearly percentage of frontier firms that were classified as frontier firms in the previous year. There is a clear increase in the persistence of frontier incumbents after 2012, which rises from 43% to 50% by 2016.

Figure 10: Persistence among Frontier Firms



Notes: Authors' calculations from the EIS balance sheets. The figure shows the percentage of frontier firms at time t that were also classified as frontier firms at time $t+1$. Frontier firms are defined as the top 5% of firms in the labor productivity distribution of each NACE-2 manufacturing sector. Labor productivity is the ratio of value added to employment. To avoid outliers, we exclude firms with labor productivity above the 99th percentile and below the 1st percentile within each sector-year group. Both group averages are weighted by firm value added. Similar results are found if outliers are not excluded.

Fact 5. *There is an increasing persistence among incumbent frontier firms.*

3.4 Business growth and re-distributive activity have been declining since 2012.

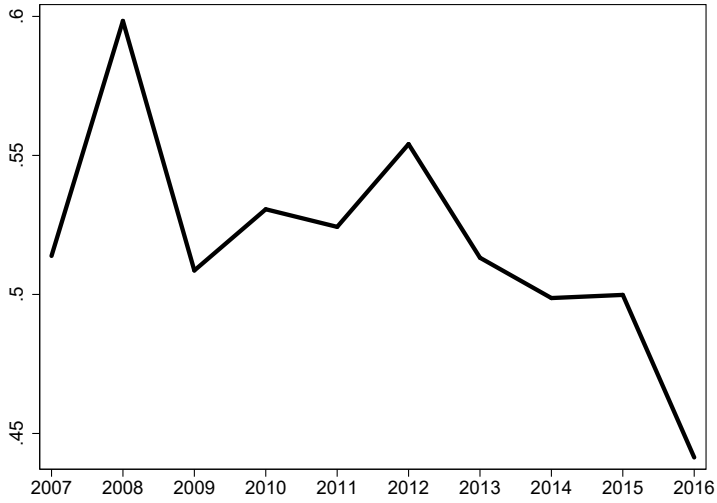
The slowdown in economic activity after 2012 is evident in general business trends, as well. The dispersion of firm growth and job reallocation display a sharp decline following 2012. Moreover, we see a negative correlation among concentration rate and labor share, which may have implications for economic inequality.

Growth rate dispersion

The dispersion of firm growth is measured using the standard deviation of employment growth. It exhibited an increasing pattern between 2009 and 2012, following the sharp decline in 2009 (Figure 11). It began declining again in 2012, which is in line with the slowdown in economic growth and the rise in the unemployment rate.

Fact 6. *Firm growth rate dispersion has declined since 2012.*

Figure 11: Growth Rate Dispersion



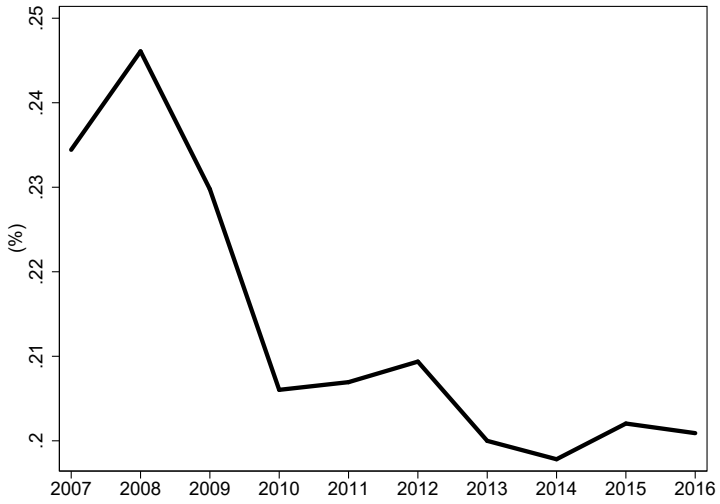
Notes: Authors' calculations from the EIS social security registry. Dispersion is defined as the standard deviation of firms' annual employment growth. We exclude outlier firm growth above the 99th percentile which corresponds to 400% employment growth.

Job reallocation

Job reallocation is measured as the sum of the absolute value of employment changes in all firms divided by total employment. It is generally used as an indicator for labor market dynamism. Job reallocation decreased from 2008 until 2010. Following a sharp decline between 2008 and 2010, job reallocation stayed relatively flat until 2012, thereafter it fell slightly (Figure 12).

Fact 7. *Job reallocation rate among incumbents has declined since 2012.*

Figure 12: Job Reallocation

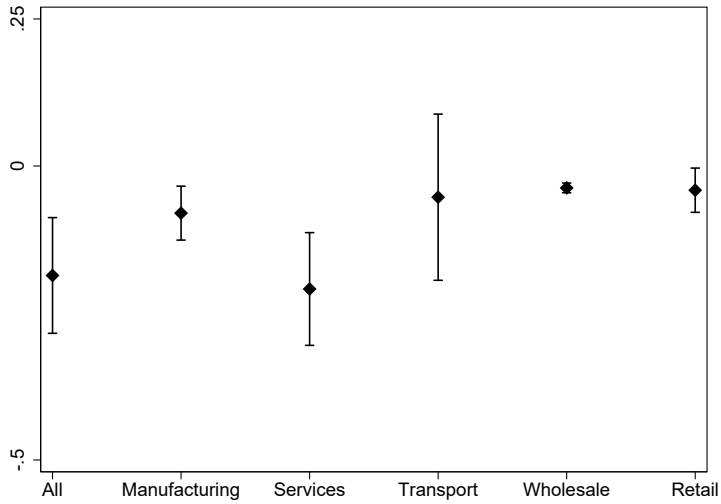


Notes: Authors' calculations from the EIS social security registry. Employment churn is defined as the sum of the absolute value of changes in employment of all firms which is then divided by total employment.

Change in concentration and labor share

Following Autor et al. (2017b), we estimate the association between labor share and concentration rate (CR4) using information on 4-digit industries for manufacturing, service, transportation, wholesale and retail sectors along with the all sectors. We find negative and statistically significant coefficients for all sectors. The results presented by Figure 13 indicate that increasing concentration could have a negative effect on labor share.

Figure 13: Market Concentration (CR4) and Labor Share



Notes: Authors' calculations from the EIS social security registry. In the figure, each bar shows the 5-95% confidence interval of β from the regression specification separately run for each sector: $\Delta labor\_share_{it} = \beta \Delta concentration_{it} + D_t + u_{it}$, where i: 4-digit industry codes, D_t: year fixed effects, concentration (CR4): the fraction of total sales conducted by the largest 4 firms.

Fact 8. *Increase in market concentration is associated with lower labor shares.*

3.5 Firm entry and the share of young firms in employment have declined since 2012.

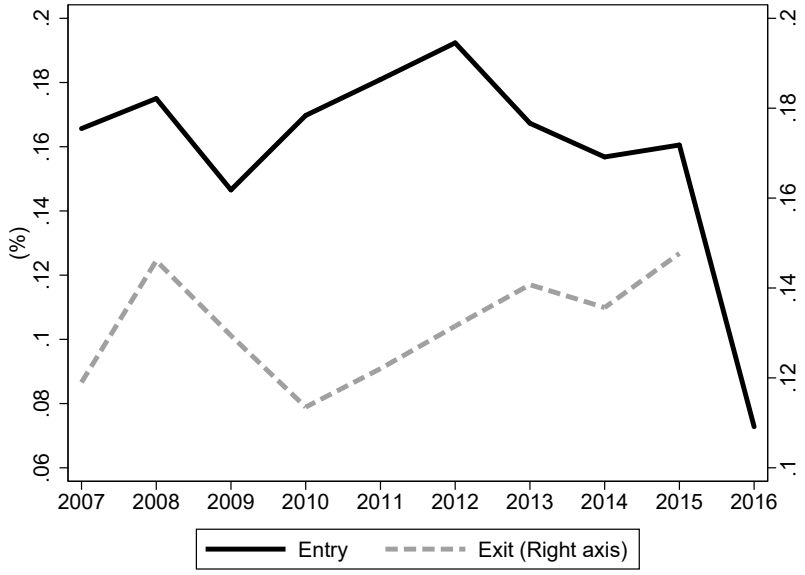
Firm entry rate began to decline in 2012. The exit rate follows a similar trend although begins to rise in 2011. A similar trend is found in the economic activity of young firms. Starting in 2012, employment share of young firms has declined. These data facts are in line with the rising market concentration among incumbent firms since 2012.

Entry and exit

Firm entry and exit rates are computed based on firms' employment status. As depicted in Figure 14, entry and exit rates have followed an upward trend until 2012 and declined thereafter. The sharp decline in 2016 is presumably partly due to the entering firms switching to informal labor, following a large increase in the minimum wage in that year.

Fact 9. *Firm entry rate has decreased and the exit rate has increased.*

Figure 14: Firm Entry and Exit Rates



Notes: Authors' calculations from the EIS social security registry. We define firms that we do not observe in the previous year as entrants and firms that do not appear the following year as exiting firms. The large decline in entry in 2016 is due to the sharp increase in minimum wage which increase informal employment and therefore reduced formal employment in the social security registry. We are unable to calculate exit rates in 2016, since we define exits as firms reporting no employment in the following year.

Employment share of young firms

Young firms are seen to be engines of dynamism and creative destruction. In recent years, young firms' economic activity has declined. Young firms have raised their share of employment up to 44% in 2011, which then declined significantly to 30% in 2016 (Figure 15). The temporary improvement in the employment share of young firms in 2014 may be due to the increased population of Syrian refugees in the southeastern part of Turkey and the new young firms that

opened in this region. Yet, we see a declining economic activity share by young firms since 2011.

Fact 10. *Economic activity among young firms has decreased since 2012.*

Figure 15: Employment Share of Young (< 5-Year Old) Firms

Notes: Authors' calculations from the EIS firm and social security registry. Plotted is the fraction of employees in total employment who are employed by firms aged less than 5 years.

In this section, we have documented 10 important empirical regularities related to firm and industry dynamics in Turkey. Most of these facts have shown some trends especially after 2012. How are all these empirical facts related? What do they tell us about industrial policy? The next section will describe a macroeconomic model to answer these questions.

4 Model

In this section, we will follow the theoretical analysis of Akcigit and Ates (2019a) closely and present a closed economy endogenous growth model in which two firms compete with step-by-step innovation in continuous time. The model is originally adopted from Aghion et al. (2001, 2005), Acemoglu and Akcigit (2012) and Akcigit and Ates (2019b). For more detailed exposition, the reader is referred to Akcigit and Ates (2019a). The model provides a rich framework to analyze the impact of the follower-exerted pressure to the leaders on pricing behavior, markups and profits since it allows strategic investment decisions, endogenous innovation and endogenous markups. We first describe the model and provide the static equilibrium with its details on production and mark-up choices focusing on balanced growth path (BGP) equilibrium. Then, we analyze the endogenous innovation decisions and their impact on aggregate indicators. Finally, we discuss some extensions of the model and empirical trends of the economy.

4.1 Production Technology and Static Equilibrium

Assume that the final good in the Turkish manufacturing sector is produced by perfectly competitive producers using a continuum 1 of intermediate goods by the following production technology

$$\ln Y(t) = \int_0^1 \ln y(j,t) dj \tag{1}$$

where $y(j,t)$ is the amount of jth intermediate at time t. The optimization of the final good producer yields the following demand for intermediate $j \in [0,1]$

$$y(j,t) = \frac{Y(t)}{p(j,t)}$$

where $p(j,t)$ is the price of intermediate j at time t. Here, we normalize the price of the final good to unity.

Each intermediate $j \in [0,1]$ is produced by one of the two incumbent firms denoted by $i \in \{1,2\}$. The varieties of intermediate j produced by these firms are perfectly substitutable. Each firm $i \in \{1,2\}$ has a linear production technology

$$y_i(j,t) = q_i(j,t) l_i(j,t)$$

where $l_i(j,t)$ denotes the employment level and $q_i(j,t)$ represents the labor productivity of firm i in industry j. These two firms are assumed to be engaged in a Bertrand competition for the leadership of the market. The labor productivity of a firm is endogenously determined in the model. The marginal cost of producing intermediate j for firm i at time t is given by

$$MC_i(j,t) = \frac{w(t)}{q_i(j,t)}$$

due to the linearity of the production technology. Here, $w(t)$ is the wage level at time t in the economy.

If the labor productivity of firm i is strictly greater than that of its opponent ($q_i(j,t) > q_{-i}(j,t)$), firm i is called as the leader and firm $-i$ as the follower in product line j. If $q_i(j,t) = q_{-i}(j,t)$, the two firms are neck-and-neck. Bertrand competition implies that the whole intermediate j in the market is supplied by the leader firm with a price equal to the marginal cost of the follower:

$$p_i(j,t) = \frac{w(t)}{q_{-i}(j,t)}.$$

Briefly, the leader sets the limit price for intermediate j. Then, the equilibrium market demand for intermediate j is

$$y(j,t) = \frac{q_{-i}(j,t)}{w(t)} Y(t) = \frac{q_{-i}(j,t)}{\omega(t)}, \tag{2}$$

where we define $\omega \equiv w/Y$.

A remark on the link between competition and markups: *Note that the leader sets the price equal to its competitor's marginal cost. Therefore when the follower falls behind, the leader starts to charge higher markups over its marginal cost. When the intensity of the market competition is highest, i.e., when the firms are neck-and-neck, markups vanish and profits erode.*

Firms invest in innovation and improve their productivity levels. Each time when a firm innovates, its productivity can increase by one step with a factor $\lambda > 1$. The productivity level of firm i for intermediate j at time t is given by

$$q_i(j,t) = \lambda^{n_i(j,t)}$$

where $n_i(j,t)$ is the number of steps that firm i innovates. The productivity gap between the firms, denoted by $m_i(j,t) = n_i(j,t) - n_{-i}(j,t)$, is defined as the difference between the improvement rungs of the leader and the follower. Therefore the productivity gap between firm i and $-i$ can be described as

$$\frac{q_i(j,t)}{q_{-i}(j,t)} = \frac{\lambda^{n_i(j,t)}}{\lambda^{n_{-i}(j,t)}} = \lambda^{n_i(j,t) - n_{-i}(j,t)} = \lambda^{m_i(j,t)}.$$

For simplicity assume that the productivity gap is at most one step, i.e., $m_i(j,t) \in \{-1, 0, 1\}$. That is to say that the firms can either be neck-and-neck ($q_i(j,t) = q_{-i}(j,t)$) or the leader can have a technology that is λ times better than the follower ($q_i(j,t)/q_{-i}(j,t) = \lambda$).

The operating profits of a producer firm of intermediate j at time t is given by

$$\pi_i(j,t) = (p_i(j,t) - MC_i(j,t)) y_i(j,t) = \begin{cases} \left(1 - \frac{1}{\lambda}\right) Y(t) & \text{if } m_i(j,t) = 1 \\ 0 & \text{if } m_i(j,t) \in \{0, -1\} \end{cases}$$

The leader makes a positive profit. Since neck-and-neck firms set their marginal cost as the price and followers have no sales, they make zero profits. A useful feature of this model is that the markups are endogenously determined in a dynamic fashion by the productivity gap between the firms producing in the same industry. For the leveled and unleveled industries, the markups can be defined as follows

$$Markup(j,t) = \frac{p_i(j,t)}{MC_i(j,t)} - 1 = \begin{cases} \lambda - 1 & \text{if } m(j,t) = 1 \\ 0 & \text{if } m(j,t) = 0 \end{cases}$$

4.2 Innovation and Dynamic Equilibrium

Firms can achieve productivity improvement through R&D investment. When a firm employs $R_i(j,t)$ units of final good in R&D investment, the firm improves one step ahead with an arrival rate $x_i(j,t)$. The R&D cost function $R_i(j,t)$ is assumed to be quadratic relying on the estimates of a large empirical literature as follows[5]

$$R_i(j,t) = \frac{x_i(j,t)^2}{2} Y(t).$$

In the equilibrium, the strategies depend only on the state variable $m_i(j,t)$ which represents the productivity gap between the two firms in product line j at time t. At state $m_i(j,t) \in \{-1,0,1\}$, the stock market value of a firm i is denoted by $V_{m_i(j,t)}$. For simplicity drop the index of product line j and time index t. The value function of the leader firm, which is one-step ahead in our model, is defined as

$$rV_1 - \dot{V}_1 = \max_{x_1} \left\{ \left(1 - \frac{1}{\lambda}\right) Y - \frac{x_1^2}{2} Y + x_1[V_1 - V_1] + x_{-1}^*[V_0 - V_1] \right\}$$

where x_{-1}^* is the equilibrium R&D effort of the follower and r is the interest rate. The first two terms are the profit and the R&D expenditure of the leader, respectively. The third one captures the improvement in its value due to successful innovation. Here, note that since the productivity gap is limited above by 1, an improvement does not happen when the leader innovates. Hence, in the equilibrium the leader does not invest in R&D. The last term captures the impact of neck-and-neck state on the leader's value as a result of the successful innovation by the follower.

The value function of a follower can be described as

$$rV_{-1} - \dot{V}_{-1} = \max_{x_{-1}} \left\{ -\frac{x_{-1}^2}{2} Y + x_{-1}[V_0 - V_{-1}] \right\}.$$

The follower makes R&D expenditures to catch up with the leader and then take the leadership over to make profits.

The value of a firm in the neck-and-neck state is given by

$$rV_0 - \dot{V}_0 = \max_{x_0} \left\{ -\frac{x_0^2}{2} Y + x_0[V_1 - V_0] + x_0^*[V_{-1} - V_0] \right\}$$

[5] See Griliches (1990), Blundell et al. (2002), Hall and Ziedonis (2001), Akcigit and Kerr (2018), among others.

where x_0^* is the equilibrium value of R&D by its competitor. The second term in the right hand side of the expression captures the case where an innovation makes it the leader while the third one captures the case where an innovation makes its competitor the leader. The constant growth rate of the net present value of a firm in the BGP lets us normalize the values as $v_{m_i} \equiv V_{m_i}/Y$.

Lemma 1 *For each $m_i \in \{-1, 0, 1\}$, v_{m_i} is given by*

$$\begin{aligned}
\rho v_1 &= \max_{x_1} \left\{ \left(1 - \frac{1}{\lambda}\right) + x_1[v_1 - v_1] + x_{-1}^*[v_0 - v_1] \right\} \\
\rho v_{-1} &= \max_{x_{-1}} \left\{ -\frac{x_{-1}^2}{2} + x_{-1}[v_0 - v_{-1}] \right\} \\
\rho v_0 &= \max_{x_0} \left\{ -\frac{x_0^2}{2} + x_0[v_1 - v_0] + x_0^*[v_{-1} - v_0] \right\}
\end{aligned}$$

Proof of Lemma 1. The proof directly follows from the normalization of the firm values and Euler equation (4), $r = g + \rho$. The Euler equation is derived from the household's maximization problem which is presented in the Appendix. ■

The maximization problems in Lemma 1 yield the following profit-maximizing innovation decisions

$$\begin{aligned}
x_1^* &= 0 \\
x_{-1}^* &= v_0 - v_{-1} \\
x_0^* &= v_1 - v_0
\end{aligned}$$

Let us denote the share of sectors with a dominant leader (i.e., $q_i(j,t) > q_{-i}(j,t)$) by μ such that $\mu \equiv \int_0^1 \mathbb{I}_{\{q_i(j,t) \neq q_{-i}(j,t)\}} dj$. The market concentration rate is proxied by μ which evolves as follows. If the follower innovates successfully, the unleveled industry moves to the neck-and-neck state. Hence, the concentration decreases at the rate x_{-1}. If one of the two neck-and-neck firms innovates successfully, this industry become unleveled and therefore the concentration increases at the rate $2x_0$. The formal description of the law of motion is given by

$$\dot{\mu} = -\mu x_{-1} + (1 - \mu) 2x_0.$$

Since in BGP equilibrium, $\dot{\mu} = 0$, we have

$$\mu^* = \frac{2x_0^*}{2x_0^* + x_{-1}^*}. \tag{3}$$

Lemma 2 *In the BGP equilibrium, the growth rate of the economy is*

$$g^* = 2x_0^*(1 - \mu^*) \ln \lambda.$$

Proof of Lemma 2. See the Appendix. ■

The only engine of the economic growth is the R&D investment of neck-and-neck firms in this economy. Since the leaders do not make R&D investment, the followers do not push the productivity frontier forward, instead they try to catch-up to the productivity level of the leader. The industries with a lower concentration and hence with higher competition display a rapid growth.

4.3 Adverse Shock to Investment Cost

In this section, we consider a case where followers and neck-and-neck firms are hit by a shock affecting the R&D investment cost. What would be the implications of this shock in our model?

Suppose that β (> 0) is the shock hitting the R&D investment cost of followers and neck-and-neck firms. Then, the value functions of these firms become

$$rV_{-1} - \dot{V}_{-1} = \max_{x_{-1}} \Big\{ -(1+\beta)\frac{x_{-1}^2}{2}Y + x_{-1}[V_0 - V_{-1}] \Big\}$$
$$rV_0 - \dot{V}_0 = \max_{x_0} \Big\{ -(1+\beta)\frac{x_0^2}{2}Y + x_0[V_1 - V_0] + x_0^*[V_{-1} - V_0] \Big\}$$

Similar to the baseline model, for each $m_i \in \{-1, 0, 1\}$, v_{m_i} is

$$\rho v_1 = \max_{x_1} \Big\{ \Big(1 - \frac{1}{\lambda}\Big) + x_1[v_1 - v_1] + x_{-1}^*[v_0 - v_1] \Big\}$$
$$\rho v_{-1} = \max_{x_{-1}} \Big\{ -(1+\beta)\frac{x_{-1}^2}{2} + x_{-1}[v_0 - v_{-1}] \Big\}$$
$$\rho v_0 = \max_{x_0} \Big\{ -(1+\beta)\frac{x_0^2}{2} + x_0[v_1 - v_0] + x_0^*[v_{-1} - v_0] \Big\}.$$

The above maximization problems leads to following innovation decisions

$$x_1^* = 0$$
$$x_{-1}^* = \frac{v_0 - v_{-1}}{1+\beta}$$
$$x_0^* = \frac{v_1 - v_0}{1+\beta}$$

Lemma 3 *(i) In a BGP equilibrium, neck-and-neck firms make higher investment in innovation than the follower firms do, i.e., $x_0^* > x_{-1}^*$.*

(ii) An increase in β reduces the innovation investment of neck-and-neck and follower firms. The effect is higher for neck-and-neck firms such that

$$-1 < \frac{dx_0}{d\beta} < \frac{dx_{-1}}{d\beta} < 0.$$

Proof of Lemma 3. See the Appendix. ■

The R&D investment is higher for the neck-and-neck firms since the greater competition induces these firms to invest in innovation to become market leaders and make profits. An increase in the size of the adverse shock deteriorates innovation investment of followers and neck-and-neck firms due to the rise in the R&D cost. The neck-and-neck firms reduce their R&D effort more than the followers do.

The introduction of the adverse shock to investment costs can explain a majority of the empirical facts we documented for Turkey following 2012. Below, we document how the theoretical predictions of the model are in line with the empirical trends.

#Fact 2. *Market concentration has increased.*

Lemma 4 *In a BGP equilibrium, an increase in the adverse shock to the followers and neck-and-neck firms increases the market concentration, i.e.,*

$$\frac{d\mu}{d\beta} > 0.$$

Proof of Lemma 4. See the Appendix. ■

An increase in the R&D investment cost of followers and neck-and-neck firms raises market concentration.

#Fact 3. *The price markups and profit share of market leaders have increased.*

Markups and profits are positive only in unleveled sectors. Hence, the average markup in this economy is equal to

$$\textit{Average Markup} = \mu(\lambda - 1).$$

A rise in market concentration due to a deterioration in innovation investment causes a proportional increase in average markups.

The aggregate profit share is determined proportional to the concentration rate as follows

$$\textit{Profit Share} = \mu\Big(1 - \frac{1}{\lambda}\Big).$$

Similarly, an increase in market concentration raises the profit share of the market leaders.

#Fact 4. *The average productivity of market leaders has not increased.*

Since the rise in market concentration is not due to innovation, the market leaders do not increase their productivity levels in our model. The followers can not credibly challenge the

market leaders and hence they can not push the leaders to innovate and increase productivity. As a result, the average productivity gap between market leaders and followers does not widen.

#Fact 5. *There is an increasing persistence among incumbent frontier firms.*

Through the lens of our model, the leadership can be handed over only when a neck-and-neck firm innovates. Hence, the survival probability of a market leader is x_{-1}. By Lemma 3, an increase in the investment cost reduces the R&D efforts of the followers and hence raises the survival rate of the market leaders, which implies an increase in the persistence of the leaders.

#Fact 6. *Firm growth rate dispersion has declined.*

An increase in the adverse shock leads to a reduction in the R&D efforts of followers and neck-and-neck firms. Hence, the growth rate of these firms decreases. A rise in the cost of investment brings more sectors to unleveled state. In these sectors, the leader firms do not invest in R&D. Together with the increase in the persistence among incumbent leaders, the growth rate dispersion declines.

#Fact 7. *Job reallocation rate among incumbents has declined.*

Since the frequency of the leadership handover in a sector decreases due to low R&D investment, job reallocation rate among incumbents also declines.

#Fact 8. *Increase in market concentration is associated with lower labor shares.*

In the model, the only input for production is labor. In the leveled sectors, the labor share is 100%. In the unleveled sectors, the labor share reduces to $1/\lambda$. Therefore, the labor share in the economy is the inverse of profit share such that

$$\textit{Labor Share} = 1 - \mu\Big(1 - \frac{1}{\lambda}\Big).$$

Hence, an increase in the market concentration leads to a decrease in labor share.

Our model in its current state can not generate any predictions about the following facts.

#Fact 1. *Average employment growth has slowed down and the unemployment rate has increased.*

#Fact 9. *Firm entry rate has decreased and the exit rate has increased.*

#Fact 10. *Economic activity among young firms has decreased.*

However, it is possible to introduce the unemployment and entry into the model to speak about the above facts.

4.4 Policy Analysis

Now, suppose that the Turkish government subsidizes the R&D expenditures of the followers and the neck-and-neck firms at rate s. Then, the value functions of followers and neck-and-neck

firms are

$$rV_{-1} - \dot{V}_{-1} = \max_{x_{-1}} \Big\{ -(1-s)(1+\beta)\frac{x_{-1}^2}{2}Y + x_{-1}[V_0 - V_{-1}] \Big\}$$
$$rV_0 - \dot{V}_0 = \max_{x_0} \Big\{ -(1-s)(1+\beta)\frac{x_0^2}{2}Y + x_0[V_1 - V_0] + x_0^*[V_{-1} - V_0] \Big\}.$$

Hence, in this extension of the model, for each $m_i \in \{-1, 0, 1\}$, v_{m_i} is given by

$$\rho v_1 = \max_{x_1} \Big\{ \Big(1 - \frac{1}{\lambda}\Big) + x_1[v_1 - v_1] + x_{-1}^*[v_0 - v_1] \Big\}$$
$$\rho v_{-1} = \max_{x_{-1}} \Big\{ -(1-s)(1+\beta)\frac{x_{-1}^2}{2} + x_{-1}[v_0 - v_{-1}] \Big\}$$
$$\rho v_0 = \max_{x_0} \Big\{ -(1-s)(1+\beta)\frac{x_0^2}{2} + x_0[v_1 - v_0] + x_0^*[v_{-1} - v_0] \Big\}.$$

The above maximization problems yield the followings

$$x_1^* = 0$$
$$x_{-1}^* = \frac{v_0 - v_{-1}}{(1-s)(1+\beta)}$$
$$x_0^* = \frac{v_1 - v_0}{(1-s)(1+\beta)}$$

Lemma 5 *An increase in R&D subsidy improves the innovation investment of neck-and-neck and follower firms. The effect is higher for neck-and-neck firms such that*

$$0 < \frac{dx_{-1}}{ds} < \frac{dx_0}{ds} < 1.$$

Proof of Lemma 5. The proof is similar to the proof of Lemma 3. ■

An increase in R&D subsidy rates provides a strong incentive to innovate by reducing the R&D cost and hence contributes to the economic growth. When the subsidy rate increases, the neck-and-neck firms raises their investment in innovation more than the followers do.

Lemma 6 *In a BGP equilibrium, an increase in the industrial support to follower and neck-and-neck firms reduces the market concentration, i.e.,*

$$\frac{d\mu}{ds} < 0.$$

Proof of Lemma 6. The proof is similar to the proof of Lemma 4. ■

A remark on the link between industrial policy, prices and innovation: *Facilitating R&D investment for followers reduces the concentration rate in an industry which in turn translates into higher*

competition, more innovation and faster growth. Moreover, weaker concentration brings down the prices to competitive levels (marginal cost) and as a result it reduces inflationary pressures.

The distortion in innovation incentives of firms leads to a rise in concentration rates and a proportional increase in average markups. A decline in R&D subsidies has a negative impact on markups. Similarly, the aggregate profit share is determined proportional to the concentration rate. Thus, a decrease in R&D subsidies raises the profit shares without productivity improvement.

Our policy analysis suggests that subsidy to the followers and neck-and-neck firms can undo the impact of adverse shocks affecting the investment cost. Business dynamism can be regained by subsidizing the follower firms who can credibly challenge the market leaders.

5 Discussion on Business Dynamism and Taking Stock

Our empirical results show that the overall business dynamism in Turkey has been slowing down since 2012. This decline in business dynamism has two major components: business dynamism among incumbents and entrants. On the former, Fact 1 shows that average firm (employment) growth has been decreasing. Unsurprisingly, lower job creation among incumbents has been coupled with increased unemployment rate (Fact 1).

Why has average employment growth slowed down? Reduced market competition could be an explanation. Indeed, our theory suggests that the primary motivation behind R&D investment and therefore growth is the competition in the market. Fact 2 shows that market concentration has been rising since 2012, which implies that the market competition has been decreasing in Turkey. This increased power by the market leaders allowed them to charge higher markups and increase their profit shares (Fact 3).

One may argue that as long as the increased market concentration is due to successful innovation and technological progress among the market leaders, it might be good for the economy and can be tolerated. However, Fact 4 does not show any sign of between the productivity of market leaders and followers, therefore the rise in market concentration is unlikely to be a result of successful innovations during that period in Turkey. While there is no increase in the productivity gap, there is a an increase in the persistence of incumbents among frontier firms as shown in Fact 5. The lack of productivity improvement highlights the importance of keeping the market concentration under control through effective industrial policies.

Healthy economies owe an important share of their productivity growth to factor reallocation from less productive to more productive firms. Therefore job reallocation rates and firm growth rate dispersion are two important indicators of creative destruction and factor reallocation. These two measures also show a declining trend after 2012. More specifically, Fact 6 documents a decline in the dispersion of growth rates and Fact 7 shows a similar drop in job reallocation rate among incumbent firms.

What were the consequences of reduced business dynamism on income distribution? Fact

8 presents some facts related to this question. It shows that increased concentration in a sector reduces the labor share in that sector. This fact, together with the increased market concentration, suggests that the economic growth has become less inclusive.

So far, we have seen that business dynamism among incumbents has been declining over time. What about business dynamism among new entrants? Facts 9 and 10 address this question. After 2012, both the entry rate and the share of economic activity by young firms (age<5) have decreased. Therefore, one may conclude that the overall business dynamism has declined in the Turkish manufacturing sector after 2012.

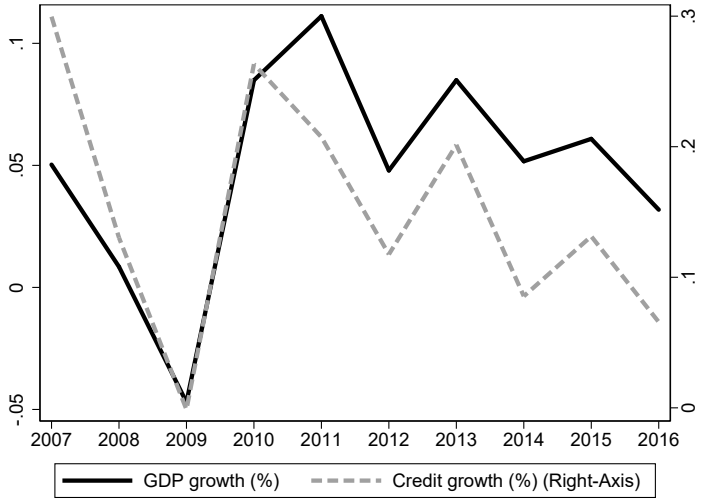
What might have caused these trends in Turkey? While it is not possible to give a conclusive answer to this question, our model suggests an adverse shock to investment costs can explain a majority of the empirical trends we documented. In what follows, we provide a detailed discussion of financial sector developments in Turkey. Firms are heavily reliant on bank finance especially for their long-term investment decisions. The tightening in the credit market that occurred in Turkey following the FED tapering in 2013 may be the adverse shock to investments costs that we expect from the model.

Global Financial Conditions, Investment Costs and Credit Allocation

After experiencing a severe financial crisis in 2000-2001, Turkey adopted financial and fiscal reforms as part of the economic stabilization program. The reforms strengthened the country's economic fundamentals and ushered in an era of strong economic growth with more than 6% annual average until 2008. This performance was one of the best growth performances of the early 2000s. Although the Global Financial Crisis (GFC) lead Turkish GDP to temporarily contract in 2009, Turkey's well-regulated financial markets and banking system helped the country weather the global stormy conditions, and GDP growth rebounded to around 9% in 2010 and 11% in 2011. Similar to many other emerging economies, credit growth is crucial for GDP growth in Turkey, where real credit growth and real GDP growth exhibit a parallel pattern, as seen in Figure 16.

In response to the 2008 GFC, major developed economies such as United States, Europe and Japan implemented economic stimulus measures on a large scale through monetary policy including quantitative easing and low interest rate policies along with fiscal measures. Such a large scale policy reaction encouraged investors to borrow at low interest rates and invest in high-yielding emerging markets, including Turkey, which supported the strong economic growth in these countries after the GFC. However, *FED tapering*, a phrase that became popular beginning in May 2013, seemed to reverse this trend. The Fed announcement of tapering began to put global financial markets on the edge, particularly the emerging markets. Coinciding with *FED tapering*, capital inflows have declined (Figure 17a) and interest rates have been on the rise since 2013 (Figure 17b) in Turkey.

Figure 16: GDP and Credit Growth

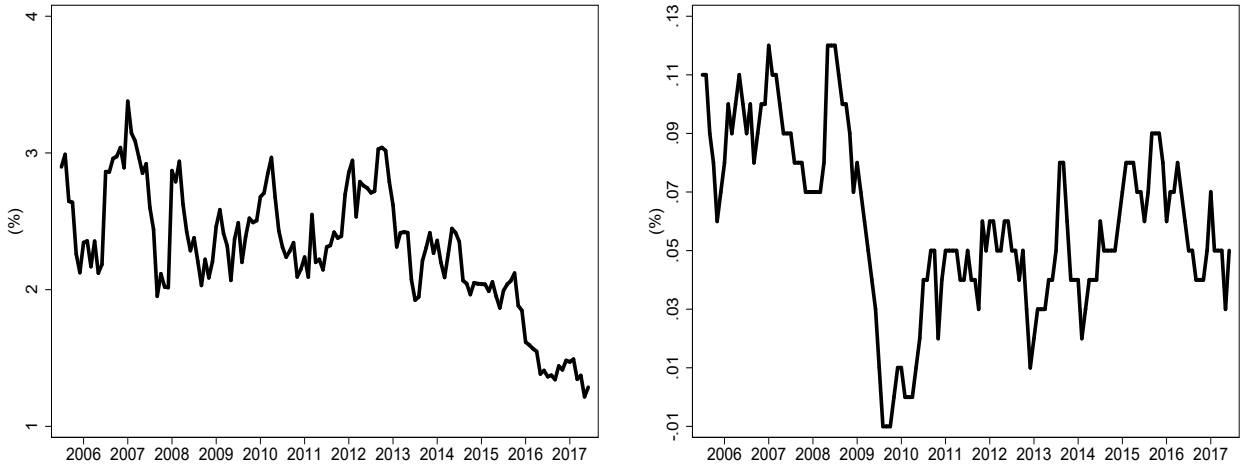


Notes: Authors' calculations from Turkish Statistics and Credit Registry. When calculating credit growth, each years' December credit balance of cash FX and TRY credits, and intermediated credits from international financial institutions are included. Nominal FX credit is firstly converted to basket exchange rate (0.3 Euro + 0.7 USD) and then, its growth rate is computed. Real TRY credit growth rate is computed as nominal TRY credit balance less annual inflation. Lastly, the real credit growth is the weighted sum of TRY and FX real credit growths based on their share in total credit balance.

Figure 17: Global Capital Flow and the Interest Rate

a) Turkey's Portfolio Share in the Global Capital Flow

b) CPI adjusted Interest Rate



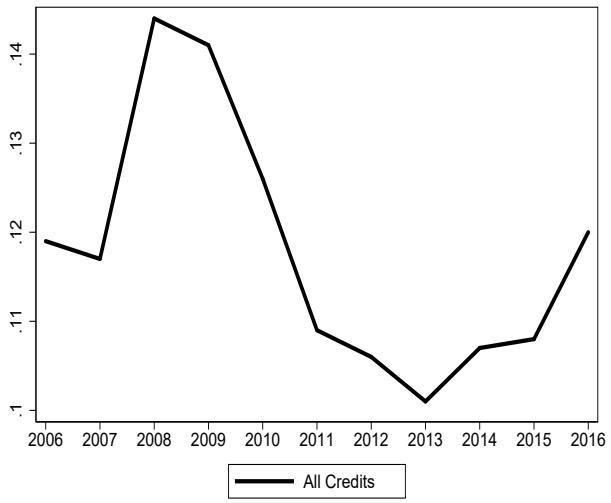
Sources: Figure 17a - Emerging Portfolio Fund Research (EPFR). Figure 17b - CBRT. Commercial weighted average lending interest rate. We adjust the interest rate to real values using the Consumer Price Index.

Reduction in global capital inflows and increase in the cost of global funds following the *FED tapering* significantly affected the domestic credit markets in emerging economies. For instance, the tightening in the domestic credit markets manifested itself in concentration of bank credits among large firms in Turkey. Figure 18a shows the HH index of total credit distribution for the manufacturing sector in Turkey that is supplemented with the further break down of credits by currency denomination in Figure 18b. According to the first figure, credit concentration

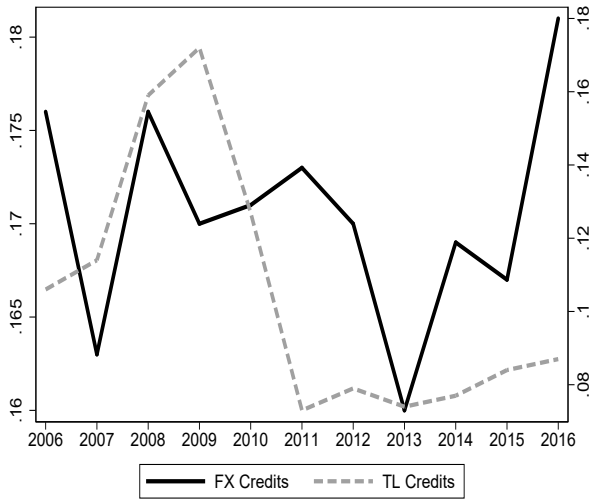
immediately trends up following the *FED tapering*, while this increase in concentration appears to be mainly driven by the concentration in FX credits (18b). This should not come at a big surprise given the high dependency of domestic banks on global funds in especially their FX lending. In other words, Turkish banks simply adjust their FX asset portfolio, by moving funds towards more prudent borrowers, in response to increase in the cost of global funds, while their availability also shrinks.

Figure 18: Credit Concentration

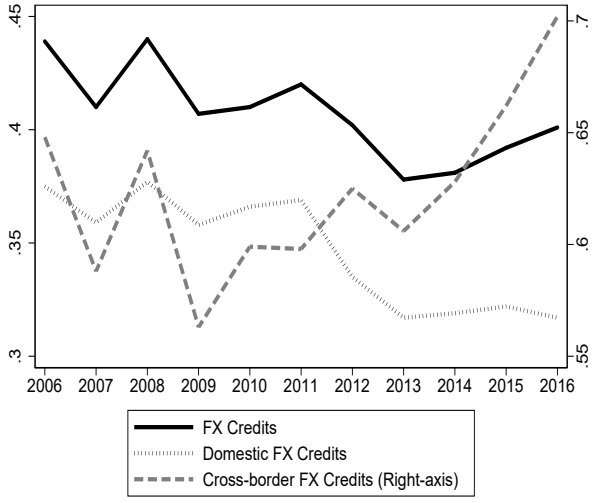
a) All Credits



b) Credit by Currency Denomination



c) Share of FX Credits Among Top-4 Firms by Source of Funding



Notes: Authors' calculations using the Credit Registry and firm balance sheets. Figures a and b report annual averages of HH index weighted by the sum of industry credits. Figure c displays the credit share of the top-4 firms, identified according to their sales ranking at the 4-digit industry level. The 4-digit industry annual averages are weighted by the sum of industry credits.

To further establish the direct like between firm size and credit concentration, we present the credit share of top-4 firms, ranked by sales, in Figure 18c. Following 2012, the credit share of top-4 firms sharply increased in especially foreign currency denominated credits. More importantly, the figure also presents the concentration in FX credits by source of funds: domestic banks and foreign banks (cross-boarder lending). According to the figure, foreign funding sources drove the concentration of credits towards larger firms, indicating that mostly market leaders could maintain access to cross-border funding in the post-2013 period.

Foreign currency denominated credits tend to be used for long-term investment due to their low cost nature (compared to domestic currency loans)[6] and availability in longer maturities. For instance, as of 2016, 52% of foreign currency denominated credits had a maturity longer than five years while the corresponding share among Turkish Lira denominated credits was only about 20% (CBRT, 2016). Concentration of credits towards large firms, particularly in FX denomination, reduces the availability of funds for the follower firms. In turn, this may have led to a decline in competition and thus, business dynamism.

6 Conclusions

In this paper, we present various trends on business dynamism in Turkish manufacturing sector using firm level micro data. We particularly focus on moments such as firm entry, exit, profitability, mark-ups, worker reallocation, labor share, concentration and labor productivity. Moreover, we employ a theoretical framework to explain the empirical observations. By introducing endogenous pricing and innovation decisions, we try to explore changes in business dynamics.

We find that the Turkish manufacturing sector began to lose its dynamism after 2012. We observe an increase in concentration for this period, however this does not seem to have resulted from successful innovation and technological progress as we do not observe an improvement in the productivity of the market leaders. Moreover, the declining trend in the job reallocation rates and firm growth dispersion could be interpreted as the failure of factor reallocation from less productive to more productive firms. Lastly, we also find a declining trend in entry rates and the share of economic activity by young firms since 2012.

Our empirical findings and theoretical investigation suggest that declining competition and business dynamism may have been caused by the adverse shock to investment costs. The tightening that occurs in the credit market after the FED announcement of tapering in 2013 may have caused the increase investment costs particularly for follower firms that could have otherwise challenged market leaders. Firm-bank level data confirms an increase in the concentration of bank loans towards larger firms. Nevertheless, we cannot rule out other explanations including

[6]Here the lower cost argument only applies to unhedged cost of FX loans, which is only relevant for firms with natural hedges given their FX revenues such as exports, tourism, other indirect guarantees, etc. Nevertheless, FX lending and borrowing is high regulated for financial stability purposes in Turkey. According to the current regulation, only firms with FX income can technically borrow in FX and the domestics banks cannot go beyond a certain FX open position.

an increase in uncertainty in Turkey during this period, which would negatively affect expected returns of firms.[7] Identifying these different effects from the rising investment costs and declining returns to investment is an important area for future research.

Regardless of the cause of declining business dynamism after 2012, the policy exercises we perform using our model offers a path forward in policymaking. The ideal support program should target the immediate competitors of the market leaders which could help them challenge the market leaders and force them to lower prices and make them invest in R&D. Raising competition through such a support programme can help establish a more dynamic business environment and improve macroeconomic performance back to its pre-2013 level.

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[7] The Turkish economy has experienced an increased economic uncertainty after 2012, as shown by Figure A.11. The figure shows the uncertainty index estimated by Sahinoz and Cosar (2018) for Turkey between 2006-2016. The presented index is based on sub-indexes that estimate uncertainty for finance, consumers, firms and forecasters in Turkey. After a peak in 2009, there is a decline until 2012 when the trend is reversed and uncertainty rises between 2013 and 2016. This increased uncertainty may have disproportionate effects on relatively small and young firms' performance (Ghosal and Loungani, 2000) - e.g., return on investment - which may impede market competition and thus, business dynamism.

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Appendix - Proofs

Preferences

The economy is populated by a continuum, with unit measure, of infinitely-lived consumers with identical log-utility preferences

$$U(t) = \int_0^\infty \exp(-\rho t) \ln C(t) dt$$

where ρ is the discount rate and $C(t)$ denotes the consumption at time t. The budget constraint of the representative consumer is given by

$$C(t) + \dot{A}(t) = w(t)L(t) + r(t)A(t)$$

where $L(t)$ denotes the labor supplied inelastically and $A(t)$ denotes the total assets at time t. The labor supply is normalized to one, i.e., $L(t) = 1$. $w(t)$ is the wage rate and $r(t)$ is the interest rate. The price of the consumption good is taken as the numeraire. Since the households own the firms in the economy, the asset market clearing condition yields that $A(t) = \int_{\mathcal{F}} V_f(t) df$ where $\mathcal{F}$ is the set of firms and $V_f(t)$ is the value of firm f at time t.

The utility maximization problem of the representative household subject to the budget constraint described above implies the standard Euler equation

$$g(t) = r(t) - \rho \tag{4}$$

Aggregate Indicators

Since in an industry j only the leader makes the production, the equilibrium labor demand is

$$l_i = \frac{1}{\omega \lambda^{m_i}}$$

for each $m_i \in \{0, 1\}$.

The aggregate productivity index in this economy is defined as the Cobb-Douglas aggregation of productivity levels of each industry $j \in [0, 1]$. More formally,

$$\ln Q \equiv \int_0^1 \ln q(j) dj.$$

By (1) and (2), the equilibrium wage is equal to

$$w = \frac{Q}{\lambda^{\mu}}. \tag{5}$$

The labor market clearing condition implies that the labor share ω can be expressed as

$$\omega = 1 - \mu\frac{\lambda - 1}{\lambda}. \tag{6}$$

Using equations (5) and (6), the level of final output can be written as

$$Y = \frac{Q}{\lambda^{\mu}\left(1 - \mu\frac{\lambda - 1}{\lambda}\right)}. \tag{7}$$

Proofs

Proof of Lemma 2. In the BGP equilibrium, the final output grows at the same rate as Q by equation (7). In this economy, the neck-and-neck firms which account for $(1 - \mu^*)$ of the economy can innovate. Since each successful innovation yields an increase in the aggregate productivity level at rate λ, we obtain

$$\ln Q(t + \triangle t) = \ln Q(t) + \ln \lambda((1 - \mu^*(t))2x_0^*(t) \triangle t + o(\triangle t)).$$

Note that the followers can also innovate, but in this case the production is assigned to one of the two neck-and-neck firms randomly. Therefore, an innovation by a follower does not improve the aggregate productivity. Dividing $\ln Q(t + \triangle t) - Q(t)$ by $\triangle t$ and taking the limit as $\triangle t \to 0$, we obtain the growth rate as follows:

$$g^* = 2x_0^*(1 - \mu^*) \ln \lambda$$

■

Proof of Lemma 3. (i) Consider the value function of a firm in the neck-and-neck state which can be written as follows

$$\rho v_0 = -(1 + \beta)\frac{x_0^{*2}}{2} + x_0^*[v_1 - v_0] + x_0^*[v_{-1} - v_0].$$

Here, by choosing $x_0^* = 0$ the firm can guarantee $v_0 \geq 0$ which implies $v_1 - v_0 \geq v_0 - v_{-1}$. Using the first order conditions of value maximization problems, we get $(1 + \beta)x_0^* \geq (1 + \beta)x_{-1}^*$. Taking the differences $\rho v_1 - \rho v_0$ and $\rho v_0 - \rho v_{-1}$ and rewriting them, we have

$$\begin{aligned}(1+\beta)\frac{x_0^2}{2}+\rho(1+\beta)x_0-\Big(1-\frac{1}{\lambda}\Big)&=0\\ \rho x_{-1}-\frac{x_0^2}{2}+x_0x_{-1}+\frac{x_{-1}^2}{2}&=0.\end{aligned}\tag{8}$$

These differences lead to $x_0^* > x_{-1}^*$, which concludes the proof of the first part.

(ii) The implicit derivatives of the equations in (8) with respect to β give the followings

$$\begin{aligned}\frac{dx_0}{d\beta}&=-\frac{(2\rho+x_0)x_0}{2(1+\beta)(\rho+x_0)}<0\\ \frac{dx_{-1}}{d\beta}&=-\frac{(x_0-x_{-1})x_0(2\rho+x_0)}{2(1+\beta)(\rho+x_0+x_{-1})(\rho+x_0)}<0.\end{aligned}$$

Since $0<(x_0-x_{-1})/(\rho+x_0+x_{-1})<1$, we have $dx_0/d\beta < dx_{-1}/d\beta$.

■

Proof of Lemma 4. Recall equation (3) that defines the concentration ratio. By differentiating this equation with respect to β,

$$\frac{d\mu}{d\beta}=\frac{\Big[2\frac{dx_0}{d\beta}(2x_0+x_{-1})-2x_0\Big(2\frac{dx_0}{d\beta}+\frac{dx_{-1}}{d\beta}\Big)\Big]}{(2x_0+x_{-1})^2}.$$

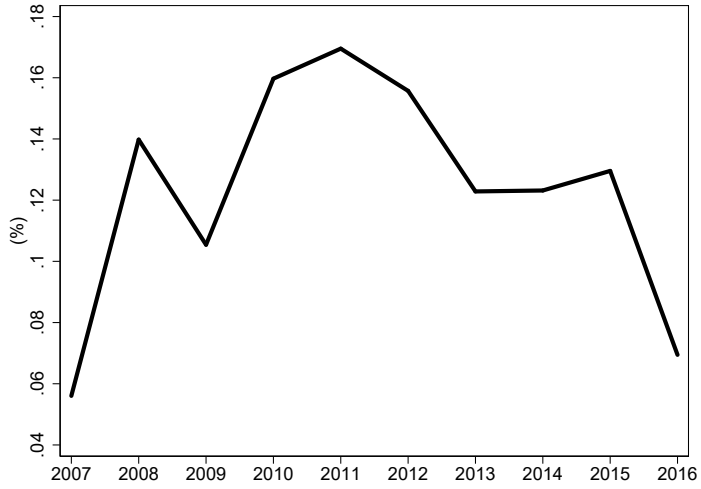
Now, we focus on the numerator of the above expression

$$\begin{aligned}A&=2\frac{dx_0}{d\beta}(2x_0+x_{-1})-2x_0\Big(2\frac{dx_0}{d\beta}+\frac{dx_{-1}}{d\beta}\Big)\\ &=2\frac{dx_0}{d\beta}x_{-1}-2x_0\frac{dx_{-1}}{d\beta}\\ &=2\frac{dx_0}{d\beta}\Big(x_{-1}-\frac{x_0^2-x_{-1}x_0}{x_{-1}+x_0+\rho}\Big)\\ &=2\frac{dx_0}{d\beta}\Big(\frac{x_{-1}^2-x_0^2+2x_{-1}x_0+\rho x_{-1}}{x_{-1}+x_0+\rho}\Big)\\ &=-2\frac{dx_0}{d\beta}\Big(\frac{\rho x_{-1}}{x_{-1}+x_0+\rho}\Big)>0.\end{aligned}$$

The last equality follows from the difference $\rho v_0-\rho v_{-1}$ in the second equation of (8). Hence, $d\mu/d\beta > 0$ ■

Appendix - Trends in The Full Economy

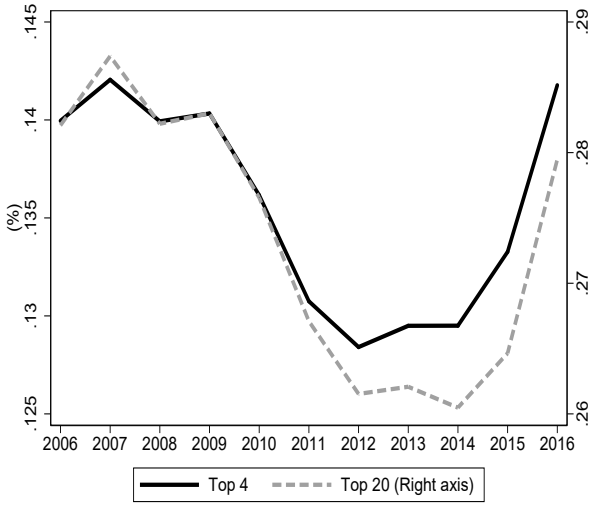
Figure A.1: Mean Employment Growth



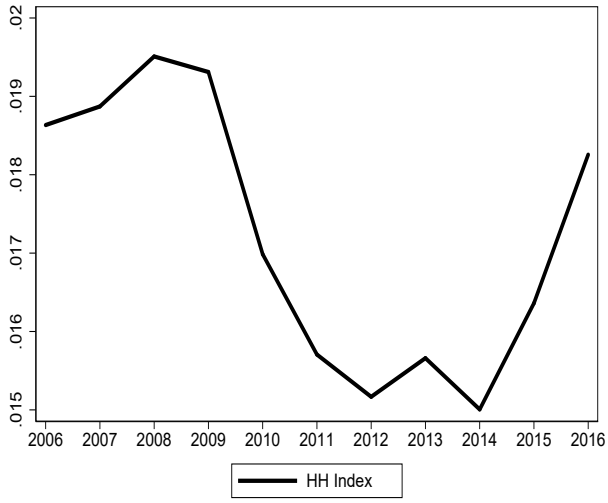
Notes: Authors' calculations from the EIS social security registry. Simple average of annual percentage change in formal employment of all firms.

Figure A.2: Market Concentration

a) Concentration Rate (CR4) and (CR20)



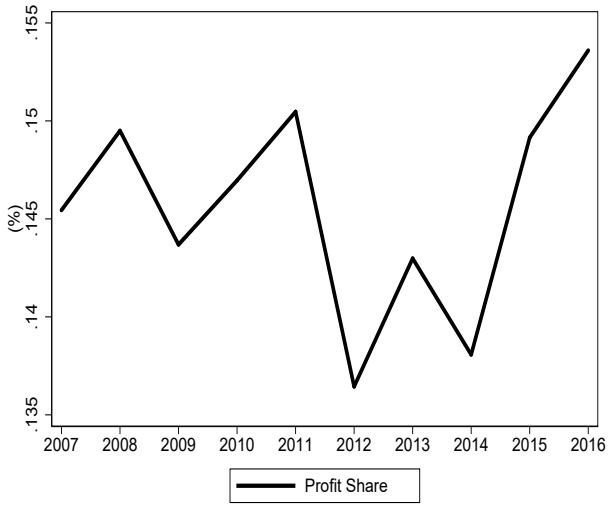
b) HH Index



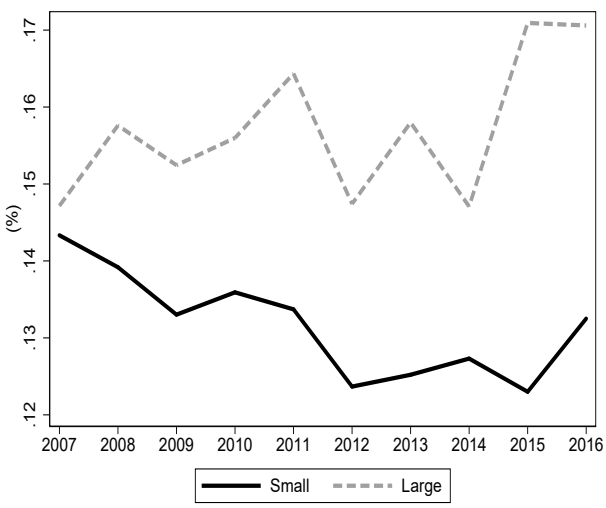
Notes: Authors' calculations from the EIS social security registry. Industry employment is used as weights. Weighted average share of employment of the largest 4 and 20 firms in a 4-digit industry. The Herfindahl-Hirschman Index (HH Index) calculated as the sum of squared share of employment of each firm at the 4-digit industry level and ranges between 0 and 1. The figure reports annual averages of 4-digit industry HH indexes weighted by industry employment.

Figure A.3: Profits

a) Average Profit Share



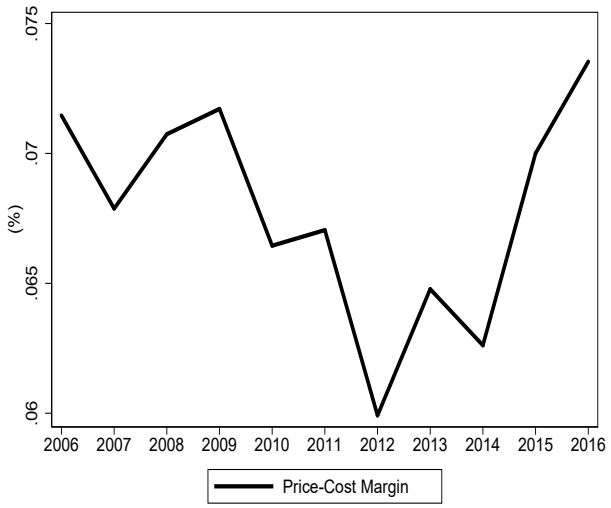
b) Profit Share by Firm Size



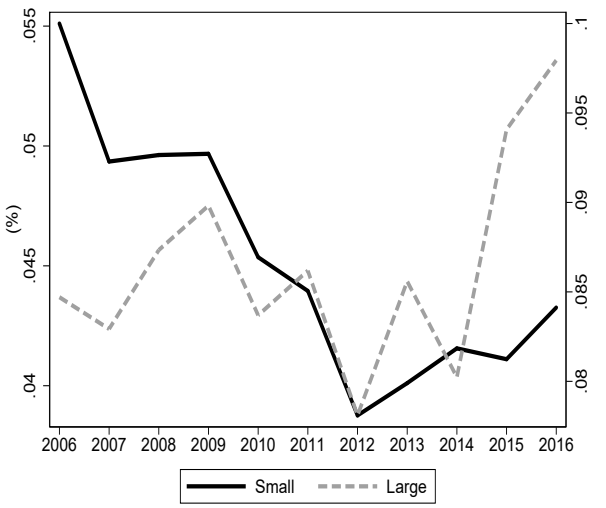
Notes: Authors' calculations using the EIS balance sheets. Profit share is the ratio of the sum of profits made by all firms to the sales and change in stocks of all firms. Small firms have fewer than 50, large firms more than 50 employees.

Figure A.4: Average Markup over Time

a) Average Markup

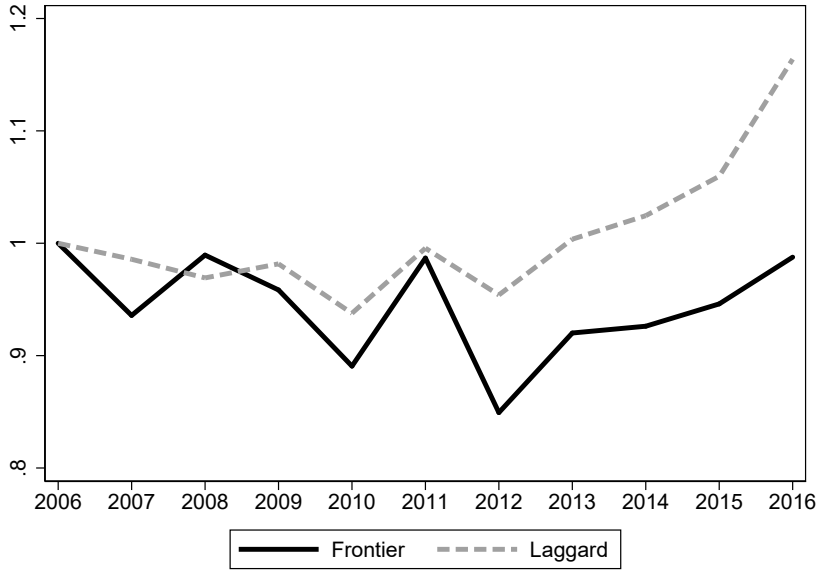


b) Markups by Firm Size



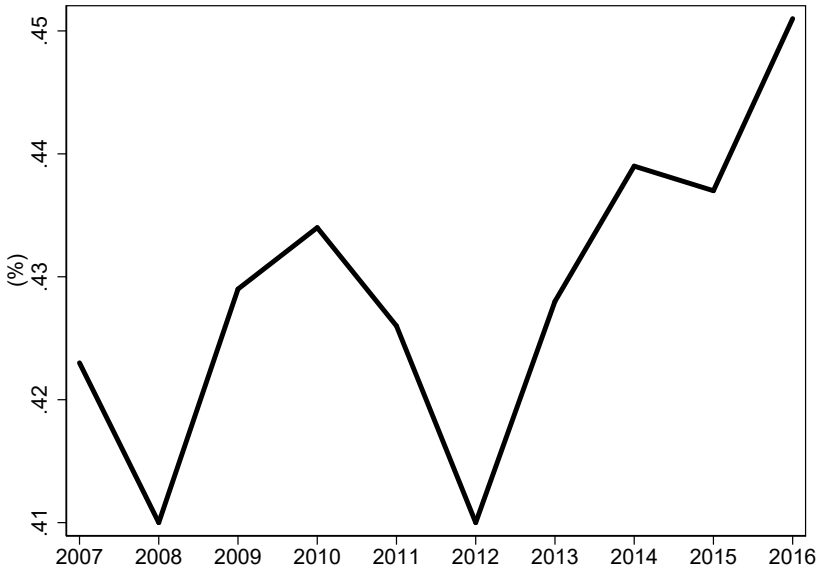
Notes: Authors' calculations using the EIS balance sheets. The price-cost margin is calculated at the firm level as the fraction of profits in the remainder of sales after subtracting labor and material input costs. The averages reported in the figure are weighted by firm sales. Small firms have fewer than 50, large firms more than 50 employees.

Figure A.5: Labor Productivity of Frontier and Laggard Firms



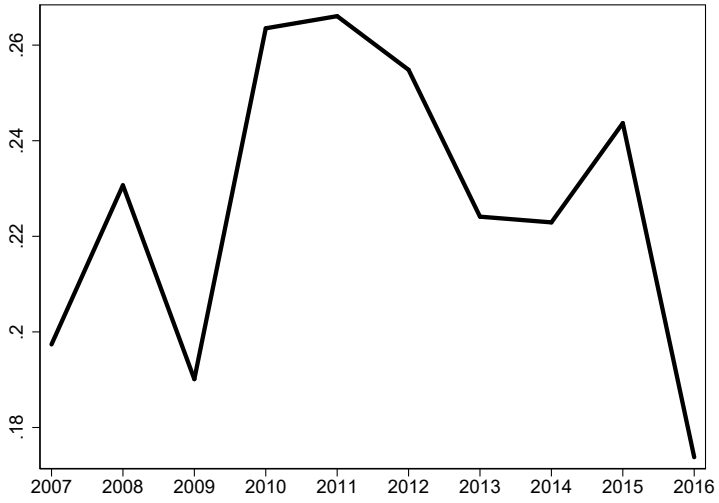
Notes: Authors' calculations from the EIS balance sheets. Frontier and laggard firms are defined as the top 5% and bottom 95% of firms in the labor productivity distribution of each NACE-2 sector. Both groups are indexed to the 2006 level. Labor productivity is the ratio of value added to employment. To avoid outliers, we exclude firms with labor productivity above the 99th percentile and below the 1st percentile within each sector-year group. Similar results are found if outliers are not excluded.

Figure A.6: Persistence among Frontier Firms



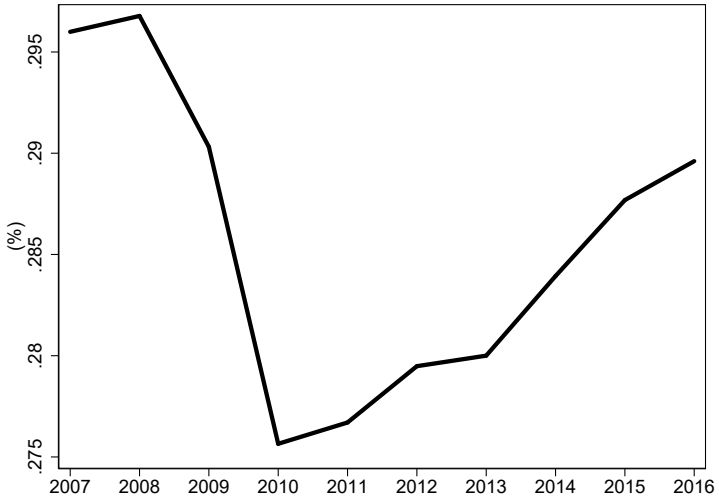
Notes: Authors' calculations from the EIS balance sheets. The figure shows the percentage of frontier firms at time t that were also classified as frontier firms at time $t+1$. Frontier firms are defined as the top 5% of firms in the labor productivity distribution of each NACE-2 sector. Labor productivity is the ratio of value added to employment. To avoid outliers, we exclude firms with labor productivity above the 99th percentile and below the 1st percentile within each sector-year group. Both group averages are weighted by firm value added. Similar results are found if outliers are not excluded.

Figure A.7: Growth Rate Dispersion



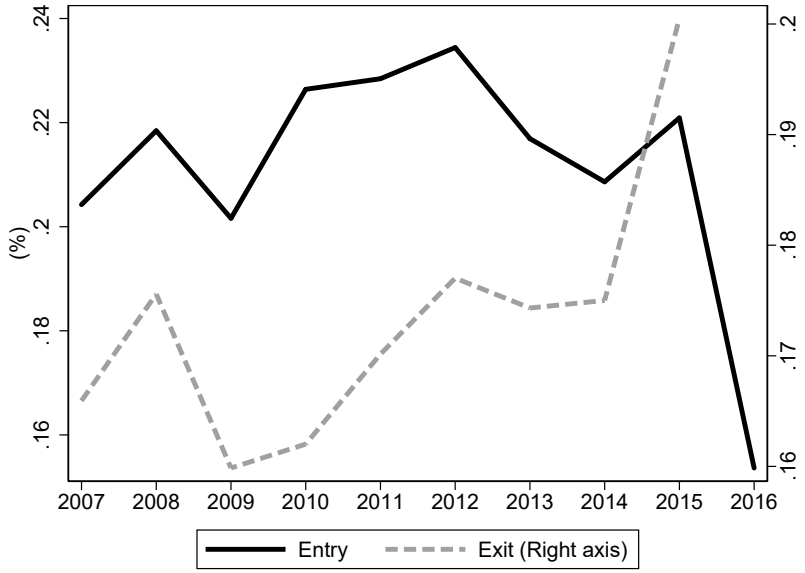
Notes: Authors' calculations from the EIS social security registry. Dispersion is defined as the standard deviation of firms' annual employment growth. We exclude outlier firm growth above the 99th percentile which corresponds to 400% employment growth.

Figure A.8: Job Reallocation



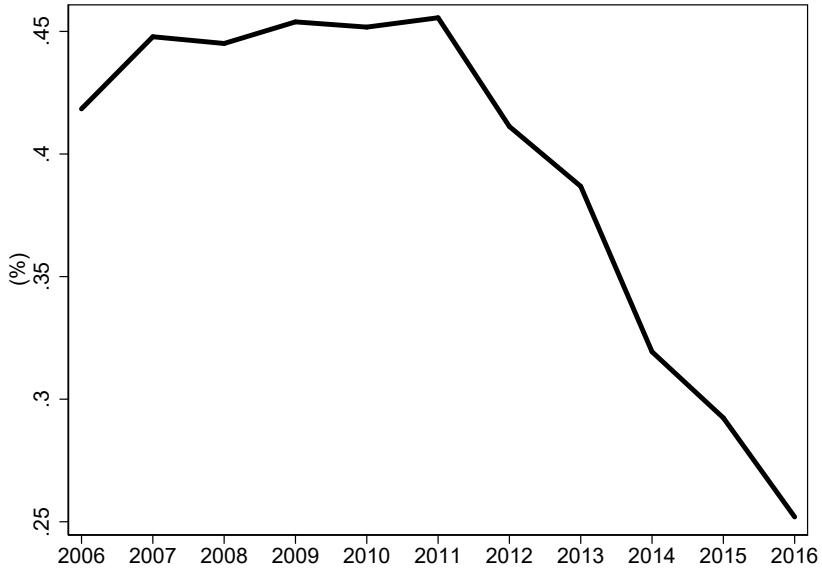
Notes: Authors' calculations from the EIS social security registry. Employment churn is defined as the sum of the absolute value of changes in employment of all firms which is then divided by total employment.

Figure A.9: Firm Entry and Exit Rates



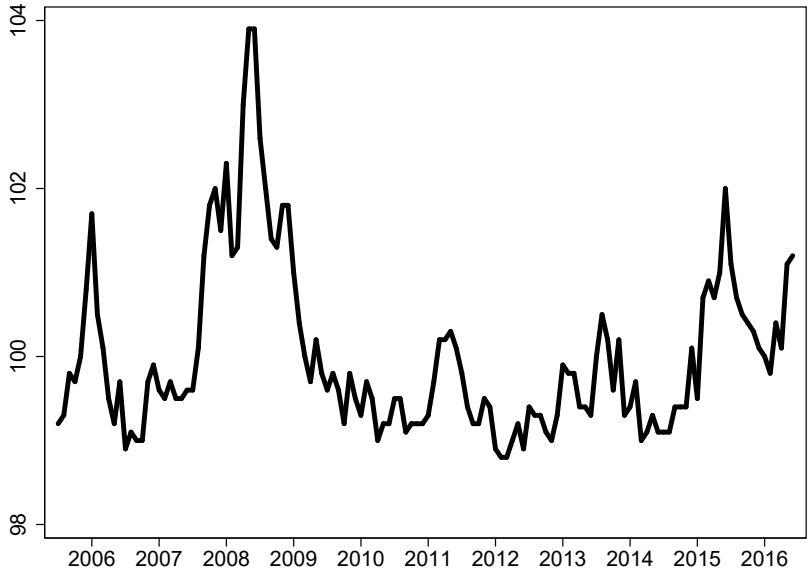
Notes: Authors' calculations from the EIS social security registry. We define firms that we do not observe in the previous year as entrants and firms that do not appear the following year as exiting firms. The large decline in entry in 2016 may be driven by the sharp increase in minimum wage which increase informal employment and therefore reduced formal employment in the social security registry.

Figure A.10: Employment Share of Young (< 5-Year Old) Firms



Notes: Authors' calculations from the EIS firm and social security registry. Plotted is the fraction of employees in total employment who are employed by firms aged less than 5 years.

Figure A.11: Estimated Uncertainty in Turkey



Notes: Sahinoz and Cosar (2018). We present overall uncertainty which is derived from financial, firm, consumer and forecast uncertainty measures.