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IFC-ECCBSO-CBRT Conference on *"Uses of Central Balance Sheet Data Offices' information"*

Co-organised by the IFC, the European Committee of Central Balance Sheet Data Offices (ECCBSO) and the Central Bank of the Republic of Turkey (CBRT)

Özdere-İzmir, Turkey, 26 September 2016

Employment growth and uncertainty: evidence from Turkey[1]

Aslıhan Atabek Demirhan and Burcu Gürcihan Yüncüler, CBRT

[1] This paper was prepared for the meeting. The views expressed are those of the authors and do not necessarily reflect the views of the BIS, the IFC or the central banks and other institutions represented at the meeting.

Employment Growth and Uncertainty: Evidence from Turkey

Aslıhan Atabek Demirhan

H. Burcu Gürcihan Yüncüler

Abstract

Using a unique matched data set of firm balance sheets and business tendency survey, we investigate the relation between employment growth and uncertainty. Company Account is an annual comprehensive dataset that contains balance sheets, income statements and firm specific information. Monthly tendency survey enables to track firms' short-term assessments in the manufacturing industry about the recent past, current situation and their expectations regarding the future course of business conditions. Using assessments of current situation and future expectations firm level uncertainties are constructed. Alternative firm-level uncertainty measures for domestic sales, foreign sales and production are employed in the analysis. Our estimation results reveal negative impact of uncertainty on employment growth. One standard deviation increase in foreign demand uncertainty is found to reduce employment growth at around 1 percentage points. We also observe that exporters, small firms and credit constrained firms are more responsive to uncertainty.

Keywords: uncertainty, firm-level, employment growth, qualitative survey data, Turkey

JEL classification: D8, C81, E24, E32

Contents

Introduction

Recent theoretical and empirical economic literature on the effects of uncertainty unveils the important role of uncertainty on the real economy. Theoretical literature focuses on two main channels to disclose the impact of uncertainty on economic activity. The first channel is through possible wait-and-see strategy of the economic actors in order to avoid a false move. According to Bloom (2009) under higher uncertainty, firms prefer to postpone their investment and hiring decisions. Existence of hiring and firing costs gives a particular reason for uncertainty to affect employment (Bloom, Bond and Van Reenen, 2007). The second channel is through the risk premia. Higher uncertainty exacerbates information asymmetry between lenders and borrowers which in turn might give rise to an increase in borrowing costs. Accordingly higher borrowing costs exert additional binding constraint for the economic activity.

Empirically the impact of uncertainty on real economy has been investigated using both aggregate time series data and panel data at country, industry or firm level. Previously conducted studies reveal that uncertainty has adverse impact on investment, firm entry decisions, capital to labour ratio, output, employment and welfare (see for example Dixit, 1989; Ghosal, 1991; Carruth et al., 2000; Rosenberg, 2002; Bloom et al., 2007). Moreover, it is observed that uncertainty may differentially affect employment in small and large firms (Ghosal and Loungani, 1996, 2000; Lensink, 2005). When we turn attention to the Turkish economy, despite the fact that firms and households are exposed to high level of uncertainty, literature on measuring the impact of uncertainty is fairly limited. Most of the existing studies use aggregate measures of uncertainty which may miss the variation at the micro level. Using firm level data, Demir (2009) investigates the impact of exchange rate volatility on employment growth and identifies an adverse impact. Cengiz (2009) utilizing aggregate macro data shows that higher exchange rate risk is associated with higher unemployment and informality in the labour market. Using business tendency survey, Arslan et al. (2013) shows that uncertainty has a negative impact on economic activity.

In the empirical literature several indicators have been used to measure uncertainty at the firm level. One of these is the stock market volatility (Bloom, 2009). Alternative measures are obtained from survey data. Guiso and Parigi (1998) and Lensink (2005) use survey data that includes information on the probability attached to beliefs about possible future outcomes by entrepreneurs. Forecast errors derived from business tendency surveys are used as a proxy for uncertainty at the aggregate level by Bachmann, Elster and Sims (2010) and at the firm level by Arslan et al. (2013).

In this paper we investigate the impact of uncertainty on employment growth by using a unique matched data set of firm balance sheets and business tendency survey. Analysis is carried out using annual data for the period 2007-2014. Using higher frequency survey data, uncertainty is measured at the firm level. In particular we construct expectation errors of firms by comparing their survey responses about expectations and realizations on their sales and production volumes. Average of the squared errors within a year constitutes the firm level measure of uncertainty.

Our paper contributes to the literature in two ways. Firstly, to our knowledge, this is the first study that merge data sets of firm balance sheets and business tendency survey for the purpose of investigating the impact of uncertainty. Second, there are limited numbers of micro-level studies on the effects of uncertainty on employment growth and to our knowledge there is none for the Turkish economy.

The structure of the paper is as follows: In the next section data, variables and empirical analysis are given. Third section is devoted to the model and empirical findings and in the last section conclusion is presented.

Data and Variables

In order to investigate empirically the impact of different type of uncertainties on employment growth of the firms, we employ panel estimation methods for 2007-2014 periods. The data used in the analysis come from two different sources; Central Bank of the Republic of Turkey Business Tendency Survey (BTS) and Company Accounts (CA). BTS is a monthly survey that includes firms' evaluation of current, past and future trends of production, volume of sales orders, level of employment, stocks of finished goods, selling prices, unit cost, capacity utilization rate, producer price inflation rate, interest rates on loans and general course of business conditions. CA dataset covers information on balance sheets, income statements and firm data—such as employment, establishment date, company town, and legal status.

These two data sets are merged using the firm's identification codes. BTS is used for the construction of firm-level uncertainty measures and CA is used for deriving firm specific variables such as employment, total assets and net sales. Firms that do not change answers for the whole observation period which correspond to 227 firms are excluded from our analysis.

Uncertainty Measures

Although theoretically the impact of uncertainty on economic activity can be conceptualized, empirical identification of this relation is neither easy nor obvious. Primarily, measurement of uncertainty is the main challenge for the empirical studies. Uncertainty can be measured along several dimensions (such as demand, supply, price, cost etc.), in different ways (as unconditional variance, forecast errors or survey measures) and at different aggregation levels (such as aggregate economy, industry or firm-level). Bloom et al. (2012) use the variance and dispersions of several variables at establishment, firm, and industry levels to measure uncertainty. Some studies, such as Leahy and Whited (1996) and Bloom (2009), use stock market volatility as a measure of uncertainty. Another widely used uncertainty measure is the variance of forecasters' expectations (Bachmann et al., 2013). Baker et al. (2013) use the frequency of policy related news to form a proxy of policy uncertainty, which they found to be related to real activity, such as investment and output. Demir (2009) uses exchange rate volatility.

Here in this study using BTS, firm-level uncertainty measures related with production, domestic orders and export orders are calculated. BTS is monthly survey that aims to produce indicators that will show the short-term tendencies in the manufacturing industry. It covers manufacturing firms with more than 20 employees. Each month firms are asked to evaluate current, past and future trends of production, volume of sales orders, level of employment, stocks of finished goods, selling prices, unit cost and capacity utilization rate, producer price inflation rate, interest rates on loans and general course of business conditions. Using over the last 3 months and next 3 months questions related with production, domestic orders and export orders, three different firm level uncertainties are calculated (Table 1).

BTS questions used for uncertainty measure construction Table 1

Production uncertainty
BTS Q1. How has your production developed over the past 3 months? It has... (increased, remained same, decreased)
BTS Q5. How do you expect your production to develop over the next 3 months? It will... (will increase, remain same, decrease)
Domestic demand uncertainty
BTS Q20. How have your domestic orders developed over the past 3 months? They have ... (increased, remained same, decreased)
BTS Q21. How do you expect your domestic orders to develop over the next 3 months? They will... (increase, remain same, decrease)
Foreign demand uncertainty
BTS Q18. How have your export orders developed over the past 3 months? They have ... (increased, remained same, decreased)
BTS Q12. How do you expect your export orders to develop over the next 3 months? They will... (increase, remain same, decrease)

Firm-level uncertainty measures are calculated as the mean of the squared forecast errors according to the following formula:

$$\mathrm{unc}_{iT}^{k} = \frac{1}{n_{iT}} \sum_{t \in T} (\text{Developments over the last 3 months}_{it}^{k} - \text{Expectations over the next 3 months}_{it-3}^{k})^2$$

unc_{iT}^{k} is the k type uncertainty for firm i in year T (t represents quarters within a year) where k stands for production, domestic demand and foreign demand uncertainty; n stands for the number of forecast errors observed within a year. Expectation errors take values from -2 to 2 (Table 2).

Expectation errors Table 2

	Development over the last 3 months(t)

		Increased	Remained unchanged	Decreased
Expectations over the next 3 months (t-3)	Increase	0	1	2
	Remain unchanged	-1	0	1
	Decrease	-2	-1	0

Other Firm Specific Variables

CA data set provides detailed firm-level information for comprehensive number of firms for a fairly long time period. Since 1989, balance sheets, income statements and firm specific information such as employment, establishment date, company town and legal status have been collected from financial and non-financial firms on an annual basis. Unique identification numbers given to each firm allow matching across the years to form a panel data set. The data has been compiling by economic sectors, classified according to four-digit level of NACE (Nomenclature Générale des Activités Economique dans les Communautes Européennes) Rev 2.

From CA data set the following firm specific variables are derived:

- Total assets variable is used as an indicator for firm size.
- Growth in total net sales variable is considered as a performance indicator for firms.
- Employment

Descriptive Analysis

Firms that are present in both data sets are matched as mentioned before. Those firms that are present in both data sets constitute our sample. As it can be seen from Table 3, on average there are 1500 firms for the 2007-2014 period.

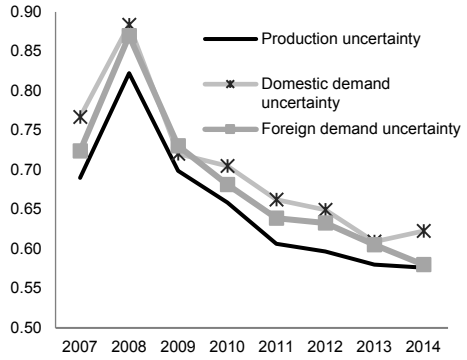
Descriptive Statistics for the Matched Sample — Table 3

	2007	2008	2009	2010	2011	2012	2013	2014
# of observations (Matched)	1056	1346	1372	1563	1721	1776	1663	1448
Average employment	480	405	383	383	378	385	376	399
Real net sales (2010=100)	119	107	100	100	104	104	113	117
Export share in total sales (%)	29	29	29	28	28	27	27	26

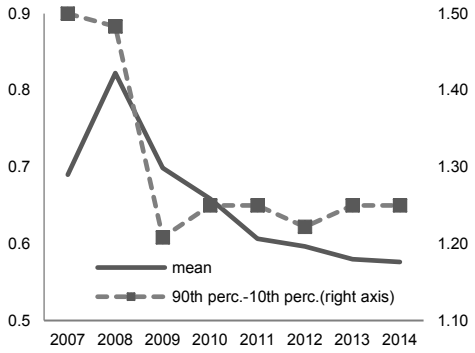
Using BTS responses of the firms that are present in the matched sample, production, domestic demand and foreign demand uncertainty measures are constructed. Summary of the uncertainty measures are given in the following figures and Table 4.

Figure 1. Uncertainty Measures Over Time (Mean)

Figure 2. Production Uncertainty



Source: Authors calculations



Source: Authors calculations

From the calculated measures, it is observed that uncertainty increased amid the crisis as expected and declined thereafter. Among different type of uncertainties, demand uncertainty seems to be higher relative to production uncertainty. From Figure 2, we can say that uncertainty dispersion widens from time to time.

Calculated uncertainty measures by specification take a value between 0 and 4. Mean and standard deviation of the measures are close to 0.6. And for 90 percent of the time, they take a value below 1.5.

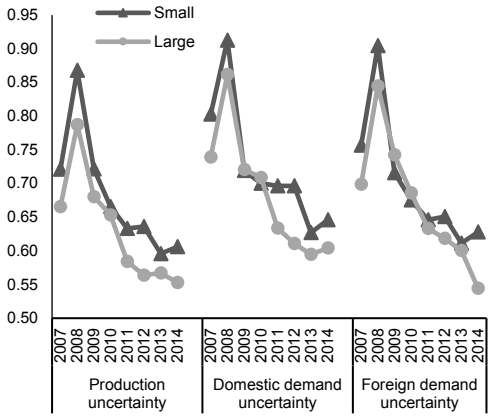
Summary Of The Calculated Uncertainty Measures

Table 4

		2007	2008	2009	2010	2011	2012	2013	2014	Total
Production uncertainty	mean	0.69	0.82	0.70	0.66	0.61	0.60	0.58	0.58	0.65
	st. dev.	0.59	0.73	0.54	0.56	0.52	0.50	0.56	0.56	0.57
	p90-p10	1.50	1.48	1.21	1.25	1.25	1.22	1.25	1.25	1.33
Domestic demand uncertainty	mean	0.77	0.88	0.72	0.70	0.66	0.65	0.61	0.62	0.69
	st. dev.	0.65	0.80	0.56	0.59	0.58	0.54	0.57	0.57	0.61
	p90-p10	1.67	1.72	1.26	1.33	1.38	1.33	1.30	1.33	1.42
Foreign demand uncertainty	mean	0.72	0.87	0.73	0.68	0.64	0.63	0.61	0.58	0.68
	st. dev.	0.64	0.79	0.57	0.58	0.59	0.54	0.57	0.56	0.61
	p90-p10	1.50	1.58	1.32	1.36	1.36	1.27	1.25	1.25	1.40

When uncertainty evaluation across different type of firms is considered, heterogeneity in the perception of uncertainty becomes obvious. Uncertainty encountered by small firms is higher for each type especially with respect to domestic and foreign demand (Figure 3). Domestic demand uncertainty is higher for firms with low export levels and firms with higher export level are subject to higher foreign demand uncertainty (Figure 4).

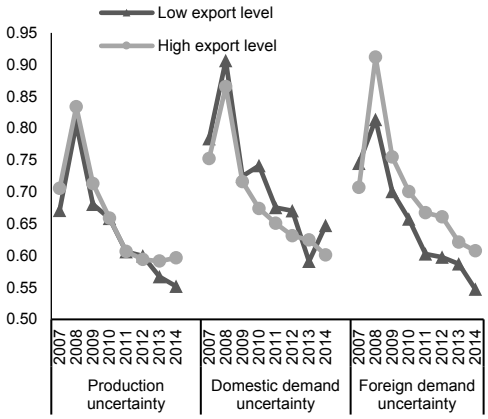
Figure 3. Uncertainty Measures Across Size Groups



Source: Authors calculations

Note: Small (large) refers to firms with total assets below (above) the median.

Figure 4. Uncertainty Measures According To Export Intensity

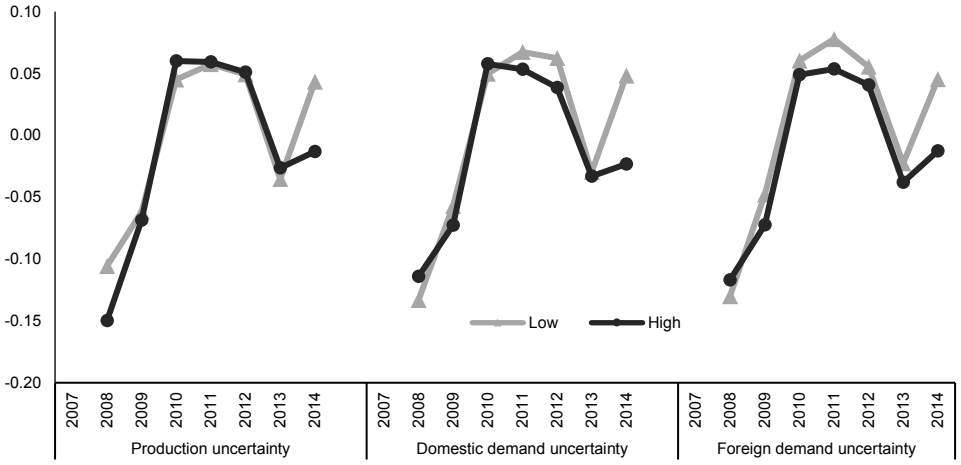


Source: Authors calculations

Note: Low (high) refers to firms with export below (above) the median.

Our main interest is to figure out the impact of uncertainty on employment growth. In order to visualize this relationship in Figure 5, average employment growth according to uncertainty levels are given. As expressed by the simple graph relating average employment growth to the uncertainty measures, there seems to be an evidence of a negative relationship between employment growth and uncertainty. In order to make close exanimation of this relation empirical model is employed in the next section.

Figure 5. Employment growth (log difference) according to uncertainty levels



Source: Authors calculations

Note: Low (high) refers to the level below (above) the median.

Empirical Model and Results

Based on theoretical arguments, negative relationship between uncertainty and employment growth is expected. To test validity of this argument for the case of Turkey, the following empirical model is estimated:

$$\Delta emp_{iT} = \alpha_i + \beta unc_{iT}^{k} + \delta Z_{iT} + \gamma T_T + \varepsilon_{iT}$$

where Δemp_{iT} stands for employment growth (log difference) of firm i at year T, unc_{iT}^{k} is the firm-level uncertainty of type k (k=production, domestic demand and foreign demand), Z_{iT} contains firm-specific control variables such as size proxied by total assets, log difference of real sales to control for economic activity. T_T denotes time dummies, α_i firm-specific unobserved heterogeneity and ε_{iT} is the error term. The estimated models are given in Table 5.

Results suggest that for the overall sample, among the uncertainty measures that we use only foreign demand uncertainty has a statistically significant adverse impact on employment growth. This is consistent with the earlier finding for the Turkish economy that point out the adverse impact of exchange rate volatility (Demir, 2009; Cengiz, 2009). Accordingly one standard deviation increase in foreign demand uncertainty reduces employment growth by around 1 (1.5*0.6) percentage points.

Model Estimation Results

Table 5

Dependent variable: log difference of employment
Model: FE

	k=		
Variables	Production uncertainty	Domestic demand uncertainty	Foreign demand uncertainty
Unc^{k}_{iT}	0.000	-0.009	-0.015*
	(0.010)	(0.009)	(0.009)
Unc^{k}_{iT-1}	-0.006	0.008	-0.012
	(0.008)	(0.009)	(0.008)
Controls	√	√	√
Time dummies	√	√	√
R^2	0.056	0.057	0.062
# of Observations	8,116	7,781	7,309
# of Firms	2,028	1,965	1,848

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

In order to observe differentiated responses of different group of firms with respect to exporter status, size and credit availability, we re-estimate the model given above with the interaction terms. The corresponding estimation results are given in the following tables.

Model Estimation Result With Exporter Status Interaction Term

Table 6

Type of interaction: Dummy=1 if export share in sales is above the median, 0 otherwise
Dependent variable: log difference of employment
Model: FE

	k=		
Variables	Production uncertainty	Domestic demand uncertainty	Foreign demand uncertainty
Unc^{k}_{iT}	0.027*	-0.001	0.001
	(0.015)	(0.012)	(0.014)
Unc^{k}_{iT-1}	0.001	0.009	0.006

	(0.013)	(0.014)	(0.014)
Unc^{k}_{iT}xDummy	-0.046**	-0.015	-0.028
	(0.020)	(0.017)	(0.019)
Unc^{k}_{iT-1}xDummy	-0.013	-0.002	-0.031*
	(0.016)	(0.017)	(0.019)
R^2	0.058	0.057	0.064
# of Observations	8,116	7,781	7,309
# of Firms	2,028	1,965	1,848

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All estimations include control variables, time dummies and the interaction dummy.

Although production uncertainty has no significant impact on average, it does matter for firms that have higher export share. Differentiated response of exporters is also significantly higher with respect to foreign demand uncertainty (Table 6). For the group of exporters one standard deviation increase in production and foreign demand uncertainty reduces employment growth by 2.8 and 1.9 percentage points respectively. Furthermore, small and credit constrained firms are adversely affected by production and domestic demand uncertainty (Table 7 and Table 8). Size of the firm is determined by the size of its assets. Credit condition of the firm is measured as the ratio of total bank credit to total amount of external resources used. This measure takes a value between 0 and 1, as it approaches to 0 credit conditions worsen for the firm, in other word firm becomes more credit constrained.

Model Estimation Result With Size Dummy Interaction Term

Table 7

Type of interaction: Dummy=1 if firm's assets are less than the median, 0 otherwise
Dependent variable: log difference of employment
Model: FE

	k=		
Variables	Production uncertainty	Domestic demand uncertainty	Foreign demand uncertainty
Unc^{k}_{iT}	-0.001	0.003	-0.026**
	(0.012)	(0.012)	(0.012)
Unc^{k}_{iT-1}	0.001	0.005	-0.003
	(0.011)	(0.012)	(0.011)
Unc^{k}_{iT}xDummy	0.005	-0.030*	0.025
	(0.022)	(0.018)	(0.020)
Unc^{k}_{iT-1}xDummy	-0.018	0.003	-0.023
	(0.017)	(0.018)	(0.018)
R^2	0.057	0.058	0.064
# of	8,116	7,781	7,309
# of Firms	2,028	1,965	1,848

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All estimations include control variables, time dummies and the interaction dummy.

Model Estimation Result With Credit Conditions Dummy Interaction Term

Table 8

Type of interaction: Dummy=1 if firm is more credit constrained than the median firm, 0 otherwise
Dependent variable: log difference of employment
Model: FE

	k=		
Variables	Production uncertainty	Domestic demand	Foreign demand
Unc^{k}_{iT}	0.019	-0.017	-0.015
	(0.014)	(0.013)	(0.013)
Unc^{k}_{iT-1}	-0.004	0.022*	-0.010
	(0.012)	(0.012)	(0.011)
Unc^{k}_{iT}xDummy	-0.037*	0.016	-0.001
	(0.019)	(0.018)	(0.018)
Unc^{k}_{iT-1}xDummy	-0.004	-0.029*	-0.004
	(0.015)	(0.016)	(0.015)
R^2	0.057	0.058	0.064
# of	8,116	7,781	7,309
# of Firms	2,028	1,965	1,848

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All estimations include control variables, time dummies and the interaction dummy

Conclusion

In this paper we estimate the impact of uncertainty on employment growth using a matched firm level data set of sector balance sheets and business tendency survey. The analysis is annual and covers the period 2007-2014. Availability of business tendency survey results at monthly frequency facilitates the computation of uncertainty measures at the firm level. Deriving from forecast error approach uncertainty measure is based on the differences between realizations and expectations of production and demand for the specified time period. In the literature there are few papers that measure the impact of uncertainty on employment growth at the firm level and to our knowledge this is the first paper that uses a matched sample of firm balance sheets and business tendency survey for this purpose.

Our results suggest that overall only foreign demand uncertainty has statistically significant adverse impact on employment growth. This is consistent with the earlier findings for the Turkish economy that point out the adverse impact of exchange rate volatility. Accordingly one standard deviation increase in foreign demand uncertainty reduces employment growth by around 1 percentage points. Although production uncertainty does not have a significant impact for the overall sample, looking at different groups, exporters, small firms and credit constrained firms are found to be negatively affected by production uncertainty. Moreover, exporters are affected more severely by foreign demand uncertainty. Finally, small and financially constrained firms are also affected by domestic demand uncertainty.

As an extension of this line of research it would be beneficial to look at the asymmetric effects of uncertainty along the business cycle.

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Employment growth and uncertainty: evidence from Turkey[1]

Aslıhan Atabek Demirhan and Burcu Gürcihan Yüncüler, CBRT

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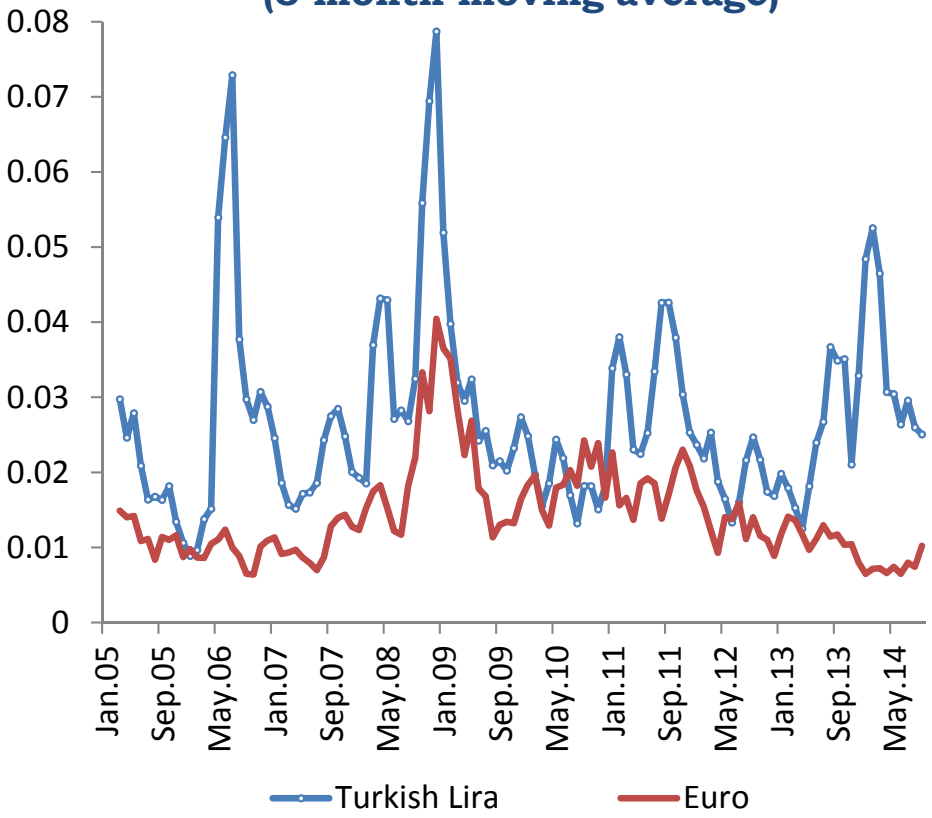
Outline

- **Motivation**
- **Literature in brief**
- **Data**
- **Analysis**
  - **Uncertainty measures**
  - **Estimation strategy**
- **Results**
  - **Relevance of exporter status and firm size on employment growth - uncertainty relationship**

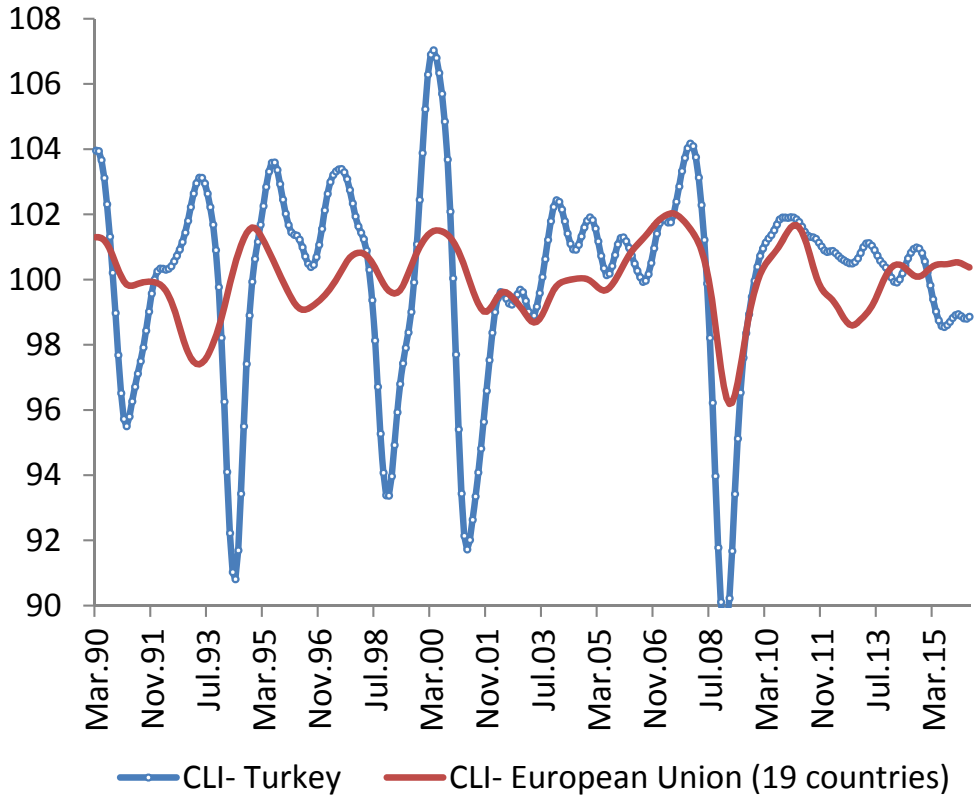
Firms in Turkey are exposed to high level of uncertainty…

Exchange rate volatility of the US dollar
(3 month moving average)



Source: Bloomberg

Composite Leading Indicators (CLI)



Source: OECD

Motivation

- **For the Turkish case, literature on measuring the impact of uncertainty is limited.**

- **Most of the literature uses aggregate measures of uncertainty. However uncertainty measured at the macro level misses the variation at the micro level.**

- **We pursue firm level analysis of uncertainty and employment dynamics using uncertainty measured at the firm level.**

Literature

- **Uncertainty affects firms' decisions via alternative channels**
  - **Theoretical explanations:**
    - **sunk cost component of expenditures adversely affects initiatives (McDonald and Siegal,1986 ; Dixit and Pindyck,1994);**
    - **greater uncertainty exacerbates information asymmetry between lenders and borrowers (small firms are affected more) (Greenwald and Stiglitz,1990);**
    - **risk-aversion**
- **Why would uncertainty affect employment in particular?**
  - **Existence of hiring and firing costs (Bloom, Bond and Van Reenen, 2007)**

Literature

- **Empirically the impact of uncertainty is measured using both aggregate time series data and panel data at country, industry or firm level.**

- **Some results from empirical studies:**

  - **uncertainty have adverse impact on investment, firm entry decisions, capital to labor ratio, output, employment, welfare**
  - **Uncertainty may differentially affect small and large firms (Ghosal and Loungani (1996, 2000), Lensink (2005))**

- **Literature on the Turkish economy:**

  - **Using firm level data Demir (2009) finds adverse impact of exchange rate volatility on employment growth**
  - **Using Business Tendency Survey, Arslan (2013) shows that one st. dev. increase in aggregate uncertainty is followed by a 0.5 p.p. decline in year-on-year change of industrial production on impact.**

Literature

- **Measuring Uncertainty**
  - **Uncertainty along several dimensions**
    - **Demand : production, sales**
    - **Price and cost: fuel price growth, energy prices, output prices**
    - **Project-related technical factors**
    - **Macro policies and macro economic trends: expectations about credits, overall state of the economy (GDP, industrial production, stock prices, inflation, interest rates)**
  - **Measured in different ways**
    - **Unconditional variance (e.g. standard deviation of stock price)**
    - **Forecast errors (based on survey results or regression framework)**
    - **Survey measures (directly using questions on the perception of uncertainty)**

Literature

- **Measuring Uncertainty**
  - **Aggregation at different levels**
    - **Industry (e.g. industry specific price as in Ghosal (2008))**
    - **Firm (e.g. sales as in Lensink (2005))**
    - **Macro level (e.g. industrial production as in Ghosal and Ye (2015))**

Data Sets

	CBRT Company Accounts (CA)	CBRT Business Tendency Survey (BTS)
Frequency **Period** **Coverage**	**Annual** **1990-2014** **Financial and non-financial companies**	**Monthly** **January 2007- August 2016** **Manufacturing firms** **(with 20 or more employees)**
Purpose	**Monitor the sectoral developments via the use of individual data from the financial statements of real sector enterprises**	**To produce indicators that will show the short-term tendencies in the manufacturing industry**
Classification	**NACE Rev.2**	**NACE Rev.2**
Scope	**Balance sheet, income statement, firm-specific information—such as employment, establishment date, company town, and legal status**	**Current, past and future trends of production, volume of sales orders, level of employment, stocks of finished goods, selling prices, unit cost and capacity utilization rate, producer price inflation rate, interest rates on loans and general course of business conditions.**

Data and Variables

	2007	2008	2009	2010	2011	2012	2013	2014
# of Observations (CA, Manufacturing)	1299	1669	1732	2101	2406	2426	2546	2473
# of Observations (Matched)	1056	1346	1372	1563	1721	1776	1663	1448
Firms by size (share, %)								
Employment ≤50	2	4	5	5	4	4	6	6
50< Employment ≤250	42	52	52	53	55	54	53	52
Employment>250	55	44	43	42	41	42	41	42
Firms by export status (share, %)								
Exporter	92	90	90	91	89	89	89	87
Share of exports within total sales (%,median)	24	25	24	23	23	22	21	20

- Firms that are present in both data sets are matched.

Data and Variables

- **From CA dataset**

  - **Profitability** (defined as operating profits per net sales)
  - **Total assets**
  - **Total sales and exports**
  - **Credit constraints** (ratio of short-term bank loans to total liabilities)
  - **Employment**
  - **Region dummies** (according to NUTS 2) and **Sector dummies** (according to NACE Rev. 2)

Data and Variables

- **From BTS dataset: Firm-level uncertainty measures are calculated using BTS**

  - **Production uncertainty**

  BTS Q1. How has your production developed over the past 3 months? It has… (increased, remained same, decreased)

  BTS Q5. How do you expect your production to develop over the next 3 months? It will… (will increase, remain same, decrease)

  - **Domestic demand uncertainty**

  BTS Q20. How have your domestic orders developed over the past 3 months? They have … (increased, remained same, decreased)

  BTS Q21. How do you expect your domestic orders to develop over the next 3 months? They will… (increase, remain same, decrease)

  - **Foreign demand uncertainty**

  BTS Q18. How have your export orders developed over the past 3 months? They have … (increased, remained same, decreased)

  BTS Q12. How do you expect your export orders to develop over the next 3 months? They will… (increase, remain same, decrease)

Data and Variables

Firm-level uncertainty measures are calculated according to the following formula:

$$unc_{iT}^{k} = \sum_{t \in T} (Developments\ over\ the\ last\ 3\ months_{it}^{k} - Expectations\ over\ the\ next\ 3\ months_{it-3}^{k})^2$$

unc_{iT}^{k} is the k type uncertainty for firm i in year T (t represents quarters within a year).

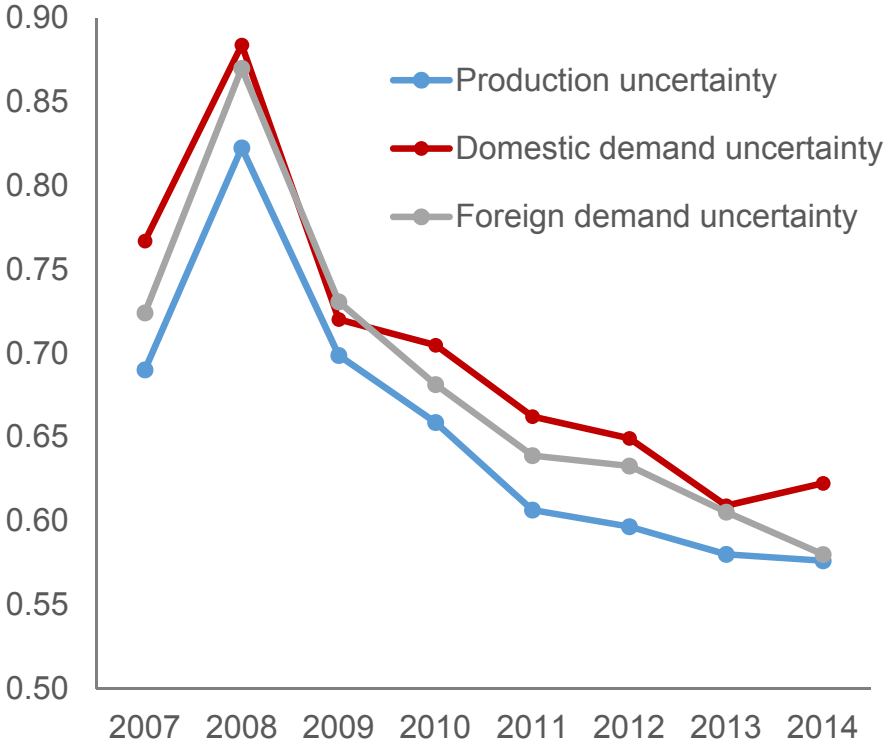
Using over the last and next 3 months questions related with production, domestic orders and export orders, three different firm level uncertainties are calculated.

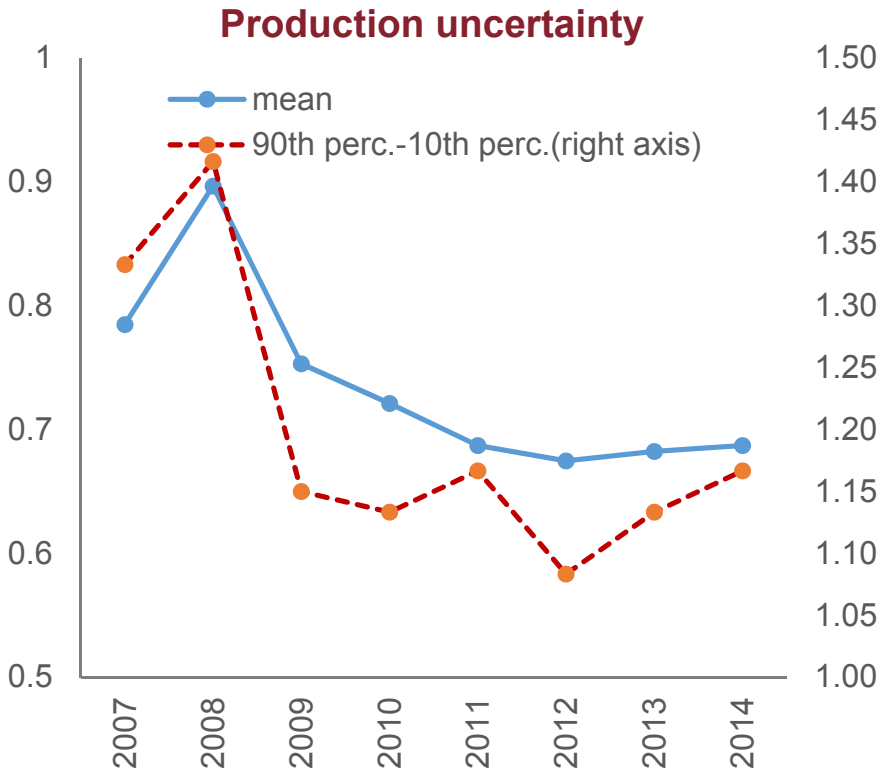
-Production uncertainty - Domestic demand uncertainty

-Foreign demand uncertainty

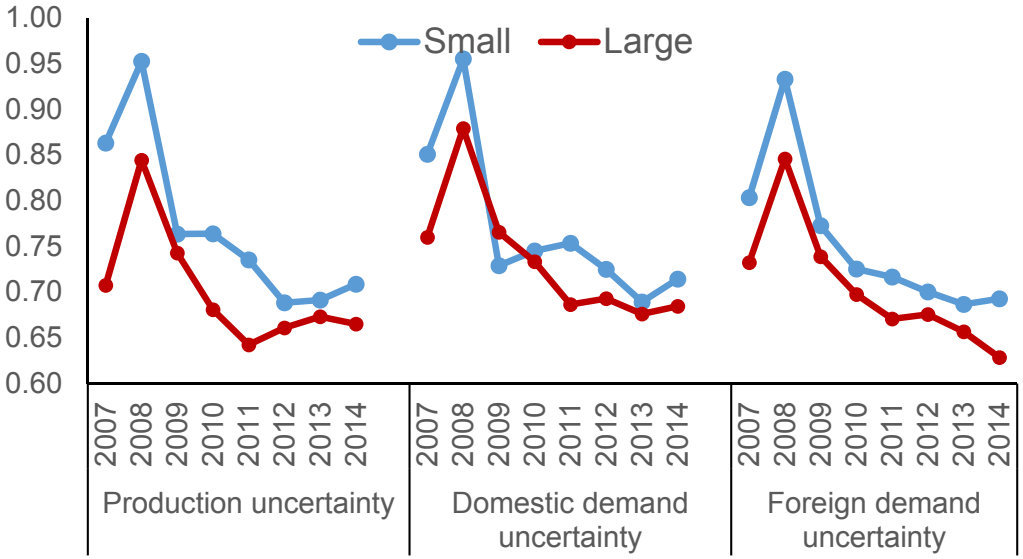
Summary Statistics: Firm Level Uncertainty Measures

- **Uncertainty measures increase during the crisis and decrease thereafter.**
- **Demand uncertainty seems to be higher relative to production uncertainty.**
- **Uncertainty dispersion widens from time to time**

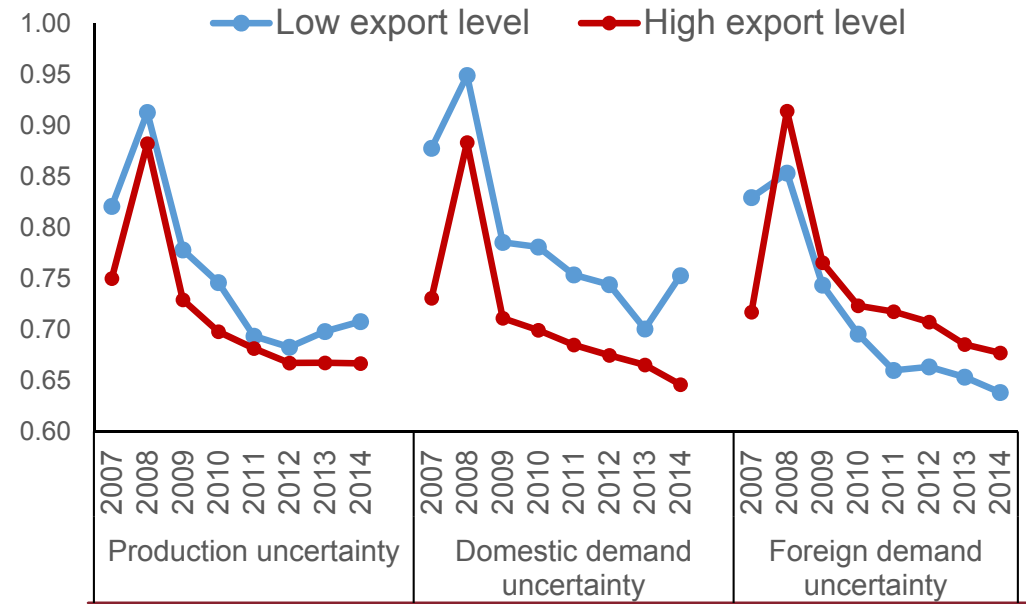




Summary Statistics: Firm Level Uncertainty Measures

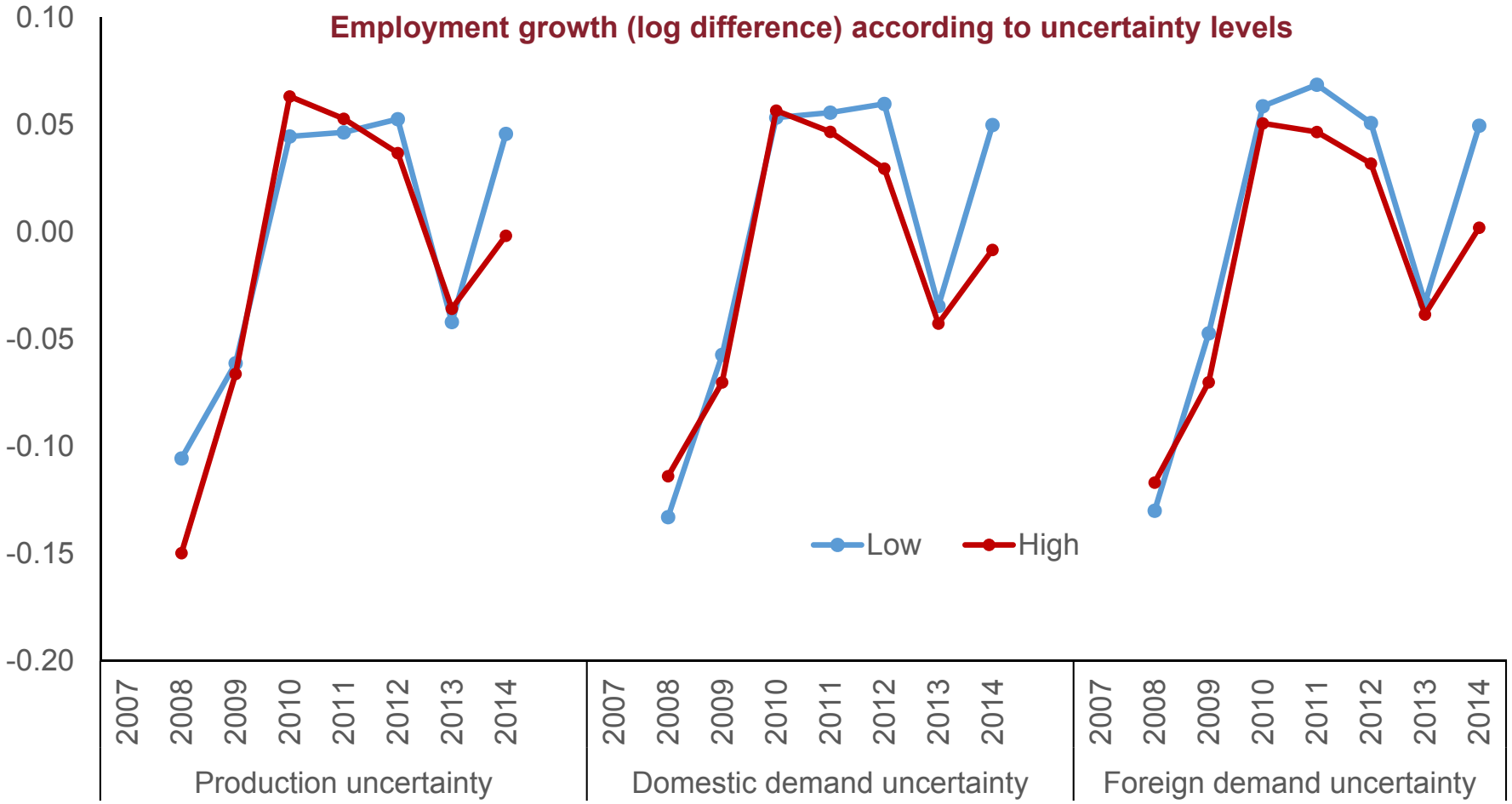


Note: Small (large) refers to firms with total assets below (above) the median.



- **Uncertainty encountered by small firms is higher.**
- **Production uncertainty is higher for firms with low export levels.**
- **Exporters are subject to higher foreign demand uncertainty.**

Summary Statistics: Employment Growth and Uncertainty



- **Without any controls, employment growth is lower for groups facing relatively higher uncertainty.**

Model

$$\Delta emp_{it} = \alpha_i + \beta unc_{it}^{k} + \delta Z_{it} + \gamma T_t + \varepsilon_{it}$$

- where Δemp_{it} stands for employment growth (log difference) of firm i at year t,
- unc_{it}^{k} is the firm-level uncertainty of type k (k=production, domestic demand and foreign demand),
- Z_{it} contains firm-specific control variables such as size proxied by total assets, profitability measured as the ratio of operating profits to net sales, log difference of real sales,
- sectoral and regional dummies are also included as control variables. T_t denotes time dummies, α_i firm-specific unobserved heterogeneity and ε_{it} is the error term.

Preliminary Estimation Results

	Random Effect Results			Fixed Effect Results		
	k=			k=		
Variables	Production uncertainty	Domestic demand uncertainty	Foreign demand uncertainty	Production uncertainty	Domestic demand uncertainty	Foreign demand uncertainty
unc^k	-0.0005	-0.008	-0.007	0.0005	-0.010	**-0.016***
	(0.007)	(0.007)	(0.007)	(0.010)	(0.010)	(0.009)
$unc^k_{(-1)}$	**-0.012***	-0.002	**-0.011***	-0.006	0.008	-0.012
	(0.007)	(0.007)	(0.006)	(0.008)	(0.009)	(0.008)
Controls	√	√	√	√	√	√
Time dummies	√	√	√	√	√	√
Region dummies	√	√	√	X	X	X
R^2						
within	0.054	0.054	0.061	0.056	0.057	0.063
between	0.208	0.190	0.186	0.055	0.043	0.062
overall	0.084	0.083	0.090	0.042	0.037	0.054
Observations	8079	7756	7291	8182	7847	7362
Groups	2004	1944	1832	2056	1993	1872

In order to measure response of different group of firms. We use interaction terms;

Type of interaction: Dummy=1 if export share in sales is above the median, 0 otherwise

Dependent variable: log difference of employment
Model: FE

	k=		
	Production uncertainty	**Domestic demand uncertainty**	**Foreign demand uncertainty**
Variables			
unc^k	0.024	-0.006	0.001
	(0.016)	(0.014)	(0.015)
unc^k_{-1}	-0.004	0.011	0.014
	(0.013)	(0.014)	(0.016)
unc^k * Dummy	**-0.048****	-0.010	-0.028
	(0.021)	(0.019)	(0.020)
unc^k_{-1}* Dummy	-0.005	-0.001	**-0.034***
	(0.017)	(0.018)	(0.019)
Observations	7,279	6,989	6,571
R^2	0.117	0.120	0.136
Number of firms	1,933	1,872	1,769

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All estimations include control variables, time dummies and the interaction dummy.

Preliminary Estimation Results

Type of interaction: Dummy=1 if firm's assets are less than the median, 0 otherwise

Dependent variable: log difference of employment
Model: FE

	k=		
	Production uncertainty	**Domestic demand uncertainty**	**Foreign demand uncertainty**
Variables			
unc^k	0.012	-0.006	-0.015
	(0.012)	(0.012)	(0.013)
unc^k_{-1}	-0.003	0.023*	0.004
	(0.011)	(0.012)	(0.011)
unc^k * Dummy	**-0.035***	-0.013	-0.001
	(0.021)	(0.020)	(0.020)
unc^k_{-1} * Dummy	-0.010	**-0.029***	-0.023
	(0.017)	(0.018)	(0.017)
Observations	7,279	6,989	6,571
R^2	0.115	0.121	0.135
Number of firms	1,933	1,872	1,769

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All estimations include control variables, time dummies and the interaction dummy.

Conclusion

Our preliminary estimation results reveal that:

- **Uncertainty has negative impact on employment growth of Turkish manufacturing firms.**

- **Foreign demand uncertainty has the highest negative impact on employment growth.**

- **Employment growth in more export oriented firms is adversely affected from uncertainty about production and foreign sales.**

- **Employment growth of small firms is adversely affected by uncertainty in production and domestic sales.**