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Evidence from Turkish Transaction Data

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1 Introduction

More than 1.4 billion people live in countries affected by violence and conflict (World Bank, 2020). While most of the conflicts occur in some of the poorest countries in the world, political instability and violence are situations affecting countries of any level of development. Also, as the new war in Europe has demonstrated, political tension can quickly lead to conflict even in developed economies.

A recent - yet rapidly growing - literature documents the devastating and long-term lasting consequences of conflict on various outcomes including education and health (Verwimp et al., 2019). One aspect that has received little attention so far is the effect of conflict on economic activity and in particular on private firms. Limited evidence exists on both the consequences experienced by firms that are directly exposed to conflicts and even more limited evidence has explored indirect effects that propagate through input-output linkages among firms. Learning about the direct and indirect effects of conflicts on firms is crucial for a better understanding of the impact of violent conflicts on the development prospects of an economy. Yet, answering these questions is also very difficult because of the lack of detailed longitudinal firm-level data that are needed to be able to causally identify the effect of conflicts on various firm outcomes.

In this paper, we adopt a production network approach by using firm-to-firm transaction data available for Turkish firms over the period 2006-2021 to understand the direct and indirect - through firm-to-firm input-output linkages - effects of firms' exposure to conflicts in a specific district (ilce) on their economic outcomes. The Turkish economy is a relevant context for the analysis of the impact of conflicts through the production-network. Local conflicts in the country are mostly geographically concentrated and led by the PKK activity in the South-Eastern and Eastern areas of the country (Kibris, 2021), nonetheless some heterogeneity there exists across the Turkish territory outside those regions that allow us to identify the - direct and indirect - impact of conflicts on firms' economic outcomes. The rather pervasive nature of conflicts in the Turkish territory does not prevent us from identifying a certain number of districts that are free of hostile events and that allow us to detect indirect effects for firms that are not directly exposed to conflicts but that can be indirectly exposed to conflicts occurring in other areas where their suppliers, customers or competitors are located.

To motivate our empirical analysis, we theoretically model an economy with two symmetric regions where conflicts in one region directly affect the local input producing firms and

indirectly - through the input-output network - also affect sales of downstream firms in the non-conflict region, due to an increase in the average price of intermediate inputs available. Our empirical results, accordingly, show that Turkish firms in affected districts experience a reduction of their sales and number of customers, especially outside their district. This contraction in the local economic activity of firms propagates to customers located in non-conflict areas outside the affected district. The latter firms also experience a contraction of sales following the increase in the conflict intensity at the suppliers' districts.

Our paper is close to the research strands on the effects of disruptive events on economic exchange. It is, then, close to the literature inspecting the impact of natural disasters on trade and international supply chains (Gassebner et al., 2010; Parsons, 2016; Barrot and Sauvagnat, 2016; Bohem et al., 2018), to the recent empirical research studying the impact of soft political conflicts and boycott campaigns on international trade (Fuchs and Kahn, 2013; Heilmann, 2016) and to aggregate and firm level studies on the impact of economic sanctions on trade (Hufbauer and Oegg, 2003; Yang et al., 2009; Slavov, 2007; Haidar, 2017).

Closer to our work is the literature searching for the quantification of the economic costs of conflicts (Abadie and Gardeazabal, 2003; Enders and Olson, 2012; Korovkin and Makarin, 2023), where we contribute to a small but growing relevant literature on the network effects of wars and conflicts. Korovkin and Makarin (2020) use transaction-level data on Ukrainian railway shipments around the start of the 2014 Russia-Ukraine crisis and document that trade declines even between partners outside the conflict areas if one of them had traded with those areas before the conflict events. Also, war induces sudden changes in the production-network structure, and firms that exogenously became more central received a relative boost to their revenues. For a median firm, network adjustment compensates for 80% of the network destruction a year after the conflict onset. Couttenier et al. (2022) similarly study how the disruptive effect of localized conflict stemming from Maoist insurgency in Eastern India during the period 2000-2009 spreads to firms in peaceful areas. They document the detrimental impact of conflict on firms' outcomes, which spreads to firms in other non-affected areas through input-output linkages. In both studies more than two thirds of aggregate losses stem from network propagation.

Differently from the above investigations we have the universe of firm-to-firm transactions for Turkey at our disposal and we can then thoroughly analyse the transmission of local conflicts across space. Beyond the analysis of the effects of conflicts on the structure

of the firm network, we contribute by analysing several dimension of heterogeneity of the conflict effects along three dimensions: the duration of the firm-to-firm relation, the typology of traded goods and the geographical distance from the conflict event. These analyses will help shedding light on the implications of conflicts for the geography of production and the product specialisation of countries. Finally, we adopt an inclusive measure of conflict that reflects the general occurrence of high intensity hostile events across districts which allows to dissect whether heterogeneous effects can be traced back for persistent versus temporary local conflicts.

The paper is organized as follows. Section 2 presents a theoretical framework to motivate our empirical analysis. Section 3.2 provides some background on Turkey. Section 3 presents the empirical analysis, by describing the data sources, explaining the methodology we adopt and discussing the results. Section 4 concludes.

2 Theoretical framework

In this section, we develop a simple theoretical model in order to motivate our empirical analysis, which aims to explore how the presence of conflicts in some regions of the country may affect firm level outcomes in the other conflict free regions, through a potential disruption along the supply chain. Our theoretical framework builds on the works by Krugman (1980), Ethier (1982), Melitz (2003), and Helpman et al. (2004).

2.1 Model set-up

We consider a closed economy with two asymmetric regions, and two differentiated good sectors that are vertically related to each other within each region: the final good sector y and the intermediate good sector m. In each region i, there are L_i consumers who supply labour at wage $w = 1$ and have CES preferences across final good varieties y with elasticity of substitution $\sigma = \frac{1}{1-\rho} > 1$, so that the final good firm level demand is given by

$$q_y^i(y) = p_y^i(y)^{-\sigma} A_y^i,$$

where p_y^i denotes the price of a single variety y, and $A_y^i = R_y^i \left(P_y^i\right)^{\sigma-1}$ is the region level

demand for final goods.[1]

Final good firms in each region have the same exogenous productivity φ_y and combine intermediate inputs through a CES production function, with elasticity of input substitution $\sigma = \frac{1}{1-\rho} > 1$, to produce the final output for local consumer only,[2] i.e.

$$q_y^i = \varphi_y X_m^i \quad \text{with} \quad X_m^i = \left[\int_0^M x_m\left(m\right)^{\frac{\sigma-1}{\sigma}} dm\right]^{\frac{\sigma}{\sigma-1}}.$$

The firm level demand of a single input variety m is given by $x_m^i = \left(p_m^i / P_m^i\right)^{-\sigma} X_m^i$, where $p_m^i\left(m\right)$ denotes the price of input variety m, and $P_m^i = \left[\int_0^M p_m\left(m\right)^{1-\sigma} dm\right]^{\frac{1}{1-\sigma}}$ is the aggregate intermediate input price. Consequently, the profit-maximizing price is $p_y^i = \frac{P_m^i}{\rho\varphi_y}$, and the firm level profit is $\pi_y^i = \frac{P_m^i}{(\sigma-1)\varphi_y} q_y^i$.

Considering that each firm faces labour-intensive fixed costs to enter the market f_e, from the free entry condition ($\pi_y^i = f_e$) we can determine the equilibrium firm-level output, which is equal to $q_y^i = \frac{f_e(\sigma-1)\varphi_y}{P_m^i}$. Therefore, the mass of final good firms (i.e. the number of available final varieties) is $N_i = \frac{R_y^i}{\sigma f_e}$, and the related price index can be written as $P_y^i = N_i^{\frac{1}{1-\sigma}} \left(\frac{P_m^i}{\rho\varphi_y}\right)$.

Since final good producers are symmetric in each region, the total demand for each input variety can be expressed as

$$q_m^i\left(m\right) = p_m^i\left(m\right)^{-\sigma} A_m^i,$$

where p_m^i is the price for the input variety m, and $A_m^i = R_m^i \left(P_m^i\right)^{\sigma-1}$ is the intermediate good demand level.[3]

Firms in the intermediate good sector are heterogeneous in productivity φ_m and use labour l_m through a linear production function $q_m^i = \varphi_m l_m$. Consequently, the firm level price in the local market is $p_m^i\left(\varphi_m\right) = \frac{1}{\rho\varphi_m}$. Since they face labour-intensive fixed costs f to

[1] $P_y^i = \left[\int_0^{N_i} p_y^i\left(y\right)^{1-\sigma} dy\right]^{\frac{1}{1-\sigma}}$ is the aggregate price index of all available final varieties N_i, while R_y^i represents the aggregate revenue in the final good sector, which is equal to aggregate income (wL_i) in each region, i.e.$R_y^i = L_i$.

[2] We assume no trade in final goods between regions, but only trade in intermediate goods, given that our focus is to explore how regional conflicts may disrupt the supply chain within the country.

[3] $q_m^i\left(m\right) = N_i x_m^i = p_m^i\left(m\right)^{-\sigma} R_m^i \left(P_m^i\right)^{\sigma-1}$, where R_m^i denotes aggregate revenue in the intermediate goods sector. Notice that $R_m^i = \left(\frac{\sigma-1}{\sigma}\right) R_y^i = \left(\frac{\sigma-1}{\sigma}\right) L^i$.

produce and sell locally, the local profit is given by

$$\pi_m^i(\varphi_m) = B_m^i(\varphi_m)^{\sigma-1} - f$$

where $B_m^i = \frac{A_m^i}{\sigma}(\rho)^{\sigma-1}$.
An intermediate good firm within each region can also serve all final good producers in the other region by paying an additional fixed cost f and facing a per-unit iceberg transportation trade cost $\tau_m > 1$. For this reason, an input supplier sets a higher price in the other region $p_m^{ij}(\varphi_m) = \tau_m p_m(\varphi_m)$, obtaining the following profit

$$\pi_m^{ij}(\varphi_m) = (\tau_m)^{1-\sigma} B_m^j(\varphi_m)^{\sigma-1} - f.$$

Intermediate good firms enter the market by paying a sunk fixed cost f_e to draw their productivity φ_m, which follows the Pareto distribution. In this case, the cumulative distribution is $G(\varphi_m) = 1 - (\varphi_m)^{-k}$, with shape parameter $k > \sigma - 1$, denoting the firm heterogeneity degree within the intermediate good sector.
Any intermediate good firm will survive as long as its local profit is positive, and will supply the other regional market only if the related profit is positive. Thus, in each region i, we can define the survival productivity cutoff φ_m^i, arising from the Local Zero Profit Condition $\pi_m^i(\varphi_m^i) = 0$, as well as the non-local-sales productivity cutoff φ_m^{ij}, through the Non-Local Zero Profit Condition $\pi_m^{ij}(\varphi_m^{ij}) = 0$. Finally, by considering that in each period there is an exogenous region-specific probability of bad shock forcing the firm to exit δ_i, a firm will attempt to enter the market only if the present value of expected profits is higher than f_e. Therefore, in each region, the survival productivity cutoff also comes from the Free Entry Condition $[1 - G(\varphi_m^i)]\widetilde{\pi}_m = f_e$, where $1 - G(\varphi_m^i)$ is the probability of survival and $\widetilde{\pi}_m$ is per-period expected profits of surviving firms:

$$\widetilde{\pi}_m^i = \frac{1}{\delta_i}\int_{\varphi_m^i}^{\infty} \pi_m^i(\varphi_m)\frac{g(\varphi_m)}{1 - G(\varphi_m^i)}d\varphi_m + \frac{1}{\delta_j}\int_{\varphi_m^{ij}}^{\infty} \pi_m^{ij}(\varphi_m)\frac{g(\varphi_m)}{1 - G(\varphi_m^i)}d\varphi_m.$$

Therefore, we have six conditions within the intermediate good sector, through which we can determine the survival cutoff, the non-local-sales cutoff, and the input price index in each region:

$$\varphi_m^{HH} = \left[\left(\frac{\sigma - 1}{k - \sigma + 1}\right)\frac{F_H}{f_e}\right]^{\frac{1}{k}}$$

$$\left(\varphi_m^{HF}\right)^{\sigma-1} = \left[\frac{B_m^H}{B_m^F}\left(\tau_m\right)^{\sigma-1}\right]\left(\varphi_m^{HH}\right)^{\sigma-1}$$

$$P_m^H = \left(\frac{\rho L_H}{\sigma f}\right)^{\frac{1}{1-\sigma}} \frac{1}{\rho\varphi_m^{HH}}$$

$$\varphi_m^{FF} = \left[\left(\frac{\sigma-1}{k-\sigma+1}\right)\frac{F_F}{f_e}\right]^{\frac{1}{k}}$$

$$\left(\varphi_m^{FH}\right)^{\sigma-1} = \left[\frac{B_m^F}{B_m^H}\left(\tau_m\right)^{\sigma-1}\right]\left(\varphi_m^{FF}\right)^{\sigma-1}$$

$$P_m^F = \left(\frac{\rho L_F^{\square}}{\sigma f}\right)^{\frac{1}{1-\sigma}} \frac{1}{\rho\varphi_m^{FF}}$$

where $F_H = f\left[\delta_H^{-1} + \delta_F^{-1}\left(\frac{B_m^H}{B_m^F}\right)^{\frac{-k}{\sigma-1}}\left(\tau_m\right)^{-k}\right]$, and $F_F = f\left[\delta_F^{-1} + \delta_H^{-1}\left(\frac{B_m^F}{B_m^H}\right)^{\frac{-k}{\sigma-1}}\left(\tau_m\right)^{-k}\right]$.

2.2 Impact of non-local conflicts on firm level outcomes

Assuming that regions have similar demand levels (Helpman et al., 2004), i.e. $A_m^H = A_m^F = A_m \;\Rightarrow\; B_m^H = B_m^F = B_m$, we can explore how firm level outcomes in a conflict free region H react to an increase in the probability of bad shocks in the other region F due to conflicts (δ_F).

It can be shown that subsequent to conflicts in region F, the input price index within a peaceful region H (P_m^H) increases, causing an increase in firm-level price (p_y^H) and a decline in firm level output (q_y^H).

3 Methodology and Analysis

3.1 Data Sources and Measurement

In order to investigate how conflicts occurring in a given territory affect local firms' economic activity as well as whether these effects propagates outside the conflict areas through firm-to-firm input-output linkages, we exploit different firm level data sources made available by the Turkish Ministry of Industry and Technology (MoIT). The latter

allows to retrieve information on the location of firms, their economic activity and their input and output linkages as well as their involvement in foreign trade activities. These information are then combined with information on the occurrence of hostile conflicts within the Turkish territory as retrieved from the ICEWS dataset (Shilliday and Lautenschlager, 2012).

Firm level data We obtain a rich set of information on the activity of Turkish firms by resting on different administrative firm level datasets made available by the MoIT. First, the MoIT provides balance sheet data which allow us to get information on firm-level sales, costs and financial variables. These information are complemented with further datasets containing information on Turkish firms' 4 digit NACE sector of activity and the location - district - of all the plants through which a firm operates. Information on total wages and employment composition over time are retrieved from employer-employee data set.

Importantly, we are able to observe the majority of firm-to-firm transactions that allow to build the firm-to-firm IO network and its changes over time. This data set covers all domestic transactions for a seller-buyer pair which are above 5,000 Turkish liras (1800$) and it accounts for, on average, more than 90 percent of Turkey's annual GDP.

Finally, Foreign Trade Statistics (FTS) collected from customs data allow us to identify all export and import flows of the universe of Turkish firms by 12 digit GTIP product (whose first 6 digits correspond to HS codes) and destination/origin country.

Conflict Measures We derive information on the number of conflicts in Turkey at the district level during the period 2006-2020 from the ICEWS dataset (Shilliday and Lautenschlager, 2012). We build our measure of conflict exposure considering all the hostile actions between individuals, groups, and the state that occurred in the main district where the firm is active.[4]

As the composition of Turkish districts changed over the period of our analysis, we develop a harmonised classification that is made up of 921 districts.

Furthermore, as the size of Turkish districts is not uniform, in order to take into account this heterogeneity, we normalize the number of hostile events occurring at district level by the district surface. While this normalization does not affect the estimation of the direct effects conflicts generate on firms' economic activity as in the relevant estimation we control for firm level fixed effects, this normalization is important in order to correctly

[4]Even for multi-plant firms located in different districts, the main district accounts, in general, for the quasi totality of a firm's employment.

capture the indirect effects that stems from the conflict exposure of a firm's suppliers, customers or competitors.

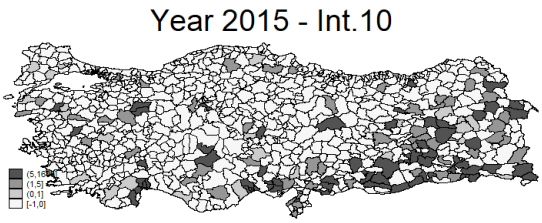
Our analysis is implemented on firms active in both manufacturing and business services over the period 2006-2020 for which we can observe balance sheet data.

3.2 Local conflicts in Turkey

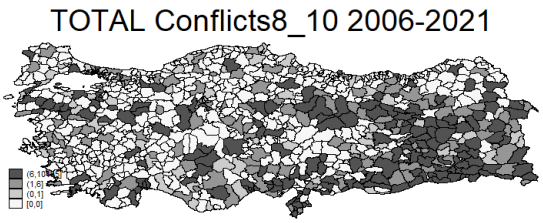
As we will explain in section 3, the occurrence of hostile conflicts within the Turkish territory is obtained from the ICEWS dataset (Shilliday and Lautenschlager, 2012). We will focus on the district level as this is the finest geographical information for a firm's location that is available in the data set we exploit. Over the period of our analysis, we can identify 921 districts[5] - ilce - in Turkey.
The classification of events in the ICEWS dataset follows the CAMEO codes. Our focus is just on hostile events that involve some degree of violence and are identified as the ones reporting an intensity either between -8 and -10, or an intensity equal to -10. The intensity is related to the degree of hostility, lower values refer to higher hostility. By resting on this definition, we are indeed considering all events that, according to CAMEO codes, are identified within the following categories: assault, fight, engagement in unconventional mass violence, and some coercion related events that involve the use of violence (such as violent repression, destruction of properties).
Our indicator of exposure to hostile conflicts reflects the number of events occurred in the district in one specific year.
In the Figure 1a we report the distribution of hostile events across Turkish districts for the one selected year, 2015, when we focus on the most hostile events displaying an intensity either between -8 and -10. Darker colors refer to a higher exposition to conflicts. Figure 1b shows the total incidence of conflicts across Turkish districts. It is interesting to notice that the occurrence of severe hostile events across districts is over represented in eastern and south-eastern districts. In this respect, the geographical distribution of conflicts almost overlaps with that reported by Kibris (2021) for casualties from PKK civil conflicts. Differently from her, however, we enlarge our measure to include all severe conflicts that may or may not involve the occurrence of deaths. Although some geographic

[5] As the classification of districts changes over time, we build a harmonised classification which stays constant for the whole period of our analysis.

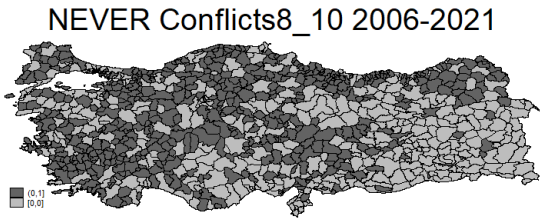
concentration emerges from the maps, we also observe some heterogeneity across the Turkish territory that will allow us to identify the - direct and indirect - impact of conflicts on firms' economic outcomes. Especially, such heterogeneity emerges when we identify those districts that can be labeled no-conflict areas as they had never been exposed to any hostile event. Figure 1c reports in dark grey those districts that, over the period of our analysis had never been exposed to any hostile event. Despite the occurrence of hostile events seems to be pervasive in the Turkish territory, we can still identify a certain number of districts that are free of hostile events and that allow us to explore indirect effects for firms that are not directly exposed to conflicts but that can be indirectly exposed to conflicts occurring in other areas where their suppliers, customers or competitors are located.



(a) Conflicts - 2015



(b) Total Conflicts 2006-2021



(c) No Conflict Districts

Figure 1: Local conflicts in Turkey 2006-2021.

Source: Shilliday and Lautenschlager (2012), own computations.

3.3 Empirical Strategy

We first explore how the direct exposition to conflicts affects their firm-level sales, purchases and other outcomes. Second, we shed light on indirect effects that propagate to firms located in non-conflict areas but that display relevant economic linkages (input and output linkages, competition) with firms directly exposed to conflicts. In particular, we analyze how the behaviour of buyers, suppliers and competitors located in areas of the country that are *not* directly affected by conflict may be influenced by its effects propagating through the production network (Barrot and Sauvagnat, 2016; Demir et al., 2023). We test whether buyers and suppliers react by turning to foreign markets or to other non-affected domestic firms to source inputs or sell goods for which the conflict created a shortage of supply or lack of demand. We further explore possible heterogeneity across links according to the size, longevity, and typology of the link as well as the nature (degree of substitutability) of the input (output) exchanged. We also test whether firms in non-conflict areas can take advantage from their competitors' exposition to conflicts.

3.3.1 Direct effects

In order to test the direct effects of conflicts, we estimate the following equation at the firm level:

$$y_{idt} = \alpha + \beta Confl_{idt} + \delta X_{idt-1} + \phi_i + \gamma_{st} + \lambda_{pt} + \epsilon_{idt} \tag{1}$$

where y_{idt} is a set of variables which reflect different dimensions of the economic activity of a firm i located in the main district d at time t. In particular, we consider firm sales ($sales_{idt}$), total purchases ($purch_{idt}$), total cost of sales ($cost\_sales_{idt}$), total and unit wages ($wages_{idt}$ and $unit\_wage_{idt}$), total employment ($empl_{idt}$), import and export activity, number of customers ($ncust_{idt}$), number of suppliers ($nsupp_{idt}$).
The variable of interest is represented by $Confl_{idt}$ which represents the number of hostile events which occurred at time t in the firm i' s main district d and which are normalized by the district surface. Since the variable has a heavily right-skewed distribution, we apply the inverse hyperbolic sine transformation.[6]

[6]The inverse hyperbolic sine transformation of a variable x is defined as $log(x + \sqrt{x^2 + 1})$ and it allows to reduce the skewness of variables that are have a heavily right-skewed distribution.e prefer this transformation instead of the logarithmic transformation since it does not change the original structure of the data. However, we also confirm the results when adopting the log transformation of our variable of

We test for both the highest hostility events (intensity equal to -10) and hostile events with an intensity ranging between -8 and -10.
X_{idt} is a vector of firm level variables in $t-1$ which changes according to the dependent variable we analyse. The covariates we control for are a firm's size (employment), sales, labour productivity, a dummy for exporter and importer status, the number of customers, the number of suppliers, unit wage, capital intensity.
In all estimations, we also control for firm fixed effects, ϕ_i, and we account for province-year (λ_{pt}) and 4-digit NACE sector-year (γ_{st}) fixed effects. In a robustness check, we also control for the occurrence of hostile events in bordering districts, by adopting the same indicator as explained above. Standard errors are clustered at firm level.

3.4 Direct Effects of Local Conflicts - Empirical Results

Table 1 shows results from the estimation of model 1 where the dependent variable is the log of firm-level real sales. They suggest that an increase in the number of conflicts at the district level is associated with a reduction in firm level sales. The coefficient estimate is negative and significant regardless of the conflict measure adopted - intensity of -10 or between -10 and -8 - and the coefficient size is higher when only manufacturing firms are considered in the first part of the Table, while it is smaller when firms from business services are included in the sample. We investigate further outcomes which can potentially be affected by local conflicts. We focus on manufacturing firms and on the highest intensity conflict measure. In Table 2 we show that local conflicts, by no means affect local firms' international activities. In Table 3, instead, we find that local conflicts reduce firms' purchases, cost of sales, employment, as well as the firm-level number of customers and suppliers. Concerning the last point, in Table 4 we find that local conflicts are associated to a decline in the number of customers and sales outside the firm district/province and to an increase in the number of customers and sales inside the firm district. Turning to the input side, local conflicts are associated to a decline in the number of suppliers and the level of purchases both within and outside the firm district/province. It seems then that if local conflicts have a direct detrimental effect the latter can be easily transmitted to firms located outside the conflict area.

interest after adding 1 or 0.000001 to take into account the presence of zero values.

Table 1: The direct impact of local conflicts on firm sales

	Manufacturing									Manufacturing + Business Services		
$Confl^{-10}$	-0.016**	-0.018***	-0.016**				-0.007**	-0.006**	-0.007**			
	[0.007]	[0.007]	[0.007]				[0.003]	[0.003]	[0.003]			
$Confl_{t-1}^{-10}$		0.007						-0.002				
		[0.006]						[0.003]				
$Confl^{-10/-8}$				-0.012**	-0.015***	-0.012**				-0.006**	-0.006**	-0.006**
				[0.006]	[0.006]	[0.006]				[0.003]	[0.002]	[0.003]
$Confl_{t-1}^{-10/-8}$					0.008						0.000	
					[0.005]						[0.002]	
$Confl^{-10\ Neighbour}$			-0.002						-0.001			
			[0.003]						[0.002]			
$Confl^{-10/-8\ Neighbour}$						-0.001						0.000
						[0.003]						[0.001]
Observations	965,989	965,989	965,989	965,989	965,989	965,989	3,020,200	3,020,200	3,020,200	3,020,200	3,020,200	3,020,200
R-squared	0.845	0.845	0.845	0.845	0.845	0.845	0.863	0.863	0.863	0.863	0.863	0.863

*** p<0.01, ** p<0.05, * p<0.1. Standard errors are displayed in brackets and are clustered by firm.
The dependent variable is the log of real sales. All specifications include the the following firm level controls all measured at t-1: the log of employment, real value added per worker, real wage, capital per unit of labour, number of customers and suppliers, export and import dummy variables. Firm, industry-year and province-year fixed effects are included in each specification.

Table 2: The direct impact of local conflicts on manufacturing firm international trade activities

	importer		import share		exporter		export share	[b] [t]
$Confl^{-10}$	-0.004	-0.003	0.004	0.003	-0.000	-0.000	-0.000	-0.001
	[0.002]	[0.002]	[0.003]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
$Confl_{t-1}^{-10}$		-0.002		0.003		0.000		0.003*
		[0.002]		[0.003]		[0.002]		[0.002]
Observations	965,989	965,989	185,941	185,941	965,989	965,989	233,647	233,647
R-squared	0.728	0.728	0.727	0.727	0.722	0.722	0.746	0.746 [b]

*** p<0.01, ** p<0.05, * p<0.1. Standard errors are displayed in brackets and are clustered by firm.
All specifications include the the following firm level controls all measured at t-1: the log of employment, real value added per worker, real wage, capital per unit of labour, number of customers and suppliers, export and import dummy variables. Firm, industry-year and province-year fixed effects are included in each specification.

Table 3: The direct impact of local conflicts on further firm outcomes

	Purchases		Cost of Sales		Employment		Unit wage		# customers		# suppliers	
$Confl^{-10}$	-0.014*	-0.017**	-0.018***	-0.019***	-0.066***	-0.062***	0.001	0.002	-0.014***	-0.016***	-0.016***	-0.018***
	[0.008]	[0.008]	[0.006]	[0.006]	[0.006]	[0.005]	[0.002]	[0.002]	[0.005]	[0.005]	[0.005]	[0.004]
$Confl_{t-1}^{-10}$		0.011		0.004		-0.012***		-0.002		0.006		0.008*
		[0.007]		[0.005]		[0.004]		[0.001]		[0.005]		[0.004]
Observations	941,228	941,228	957,523	957,523	965,937	965,937	965,937	965,937	1,035,770	1,035,770	1,048,497	1,048,497
R-squared	0.879	0.879	0.890	0.890	0.913	0.913	0.892	0.892	0.871	0.871	0.869	0.869

*** p<0.01, ** p<0.05, * p<0.1. Standard errors are displayed in brackets and are clustered by firm.
All specifications include the the following firm level controls all measured at t-1: the log of employment, real value added per worker, real wage, capital per unit of labour, number of customers and suppliers, export and import dummy variables. Firm, industry-year and province-year fixed effects are included in each specification.

Table 4: The direct impact of local conflicts on input and output relations

	# customers				sales				# suppliers				purchases			
	In District		Out District		In District		Out District		In District		Out District		In District		Out District	
																[t]
$Confl^{-10}$	0.053***	0.048***	-0.031***	-0.033***	0.336***	0.315***	-0.113***	-0.114***	-0.010*	-0.009*	-0.012***	-0.017***	-0.082*	-0.069	-0.074***	-0.081***
	[0.006]	[0.006]	[0.005]	[0.004]	[0.048]	[0.045]	[0.021]	[0.020]	[0.005]	[0.005]	[0.004]	[0.004]	[0.045]	[0.043]	[0.019]	[0.019]
$Confl_{t-1}^{-10}$		0.016***		0.006		0.067**		0.004		-0.005		0.014***		-0.043		0.023
		[0.004]		[0.004]		[0.034]		[0.018]		[0.004]		[0.004]		[0.034]		[0.015]
Constant	-0.057**	-0.058**	0.053**	0.053**	3.398***	3.394***	6.937***	6.936***	-0.088***	-0.088***	0.087***	0.086***	4.179***	4.182***	7.948***	7.947***
	[0.023]	[0.023]	[0.027]	[0.027]	[0.171]	[0.171]	[0.113]	[0.113]	[0.024]	[0.024]	[0.024]	[0.024]	[0.160]	[0.160]	[0.096]	[0.096]
Observations	1,034,362	1,034,362	1,034,362	1,034,362	1,034,362	1,034,362	1,034,362	1,034,362	1,047,072	1,047,072	1,047,072	1,047,072	1,047,072	1,047,072	1,047,072	1,047,072
R-squared	0.794	0.794	0.877	0.877	0.655	0.655	0.718	0.718	0.799	0.799	0.876	0.876	0.666	0.666	0.702	0.702

	# customers				sales				# suppliers				purchases			[t]
	In Province		Out Province		In Province		Out Province		In Province		Out Province		In Province		Out Province	
$Confl^{-10}$	0.011**	0.008*	-0.021***	-0.021***	0.057**	0.059***	-0.088***	-0.095***	0.006	0.004	-0.013***	-0.016***	0.082***	0.078***	-0.111***	-0.111***
	[0.005]	[0.005]	[0.005]	[0.004]	[0.024]	[0.023]	[0.031]	[0.030]	[0.004]	[0.004]	[0.004]	[0.004]	[0.019]	[0.019]	[0.032]	[0.031]
$Confl_{t-1}^{-10}$		0.009**		0.001		-0.007		0.024		0.006*		0.010**		0.013		-0.000
		[0.004]		[0.005]		[0.019]		[0.029]		[0.004]		[0.004]		[0.016]		[0.030]
Constant	0.277***	0.277***	-0.436***	-0.436***	7.795***	7.796***	2.534***	2.533***	0.268***	0.267***	-0.437***	-0.437***	8.256***	8.256***	3.671***	3.671***
	[0.024]	[0.024]	[0.027]	[0.027]	[0.113]	[0.113]	[0.153]	[0.153]	[0.024]	[0.024]	[0.025]	[0.025]	[0.104]	[0.104]	[0.144]	[0.144]
Observations	1,034,362	1,034,362	1,034,362	1,034,362	1,034,362	1,034,362	1,034,362	1,034,362	1,047,072	1,047,072	1,047,072	1,047,072	1,047,072	1,047,072	1,047,072	1,047,072
R-squared	0.841	0.841	0.875	0.875	0.679	0.679	0.722	0.722	0.851	0.851	0.874	0.874	0.697	0.697	0.730	0.730

*** p<0.01, ** p<0.05, * p<0.1. Standard errors are displayed in brackets and are clustered by firm.
All specifications include the the following firm level controls all measured at t-1: the log of employment, real value added per worker, real wage, capital per unit of labour, number of customers and suppliers, export and import dummy variables. Firm, industry-year and province-year fixed effects are included in each specification.

3.4.1 Indirect effects: firm-to-firm input-output linkages

We then move to explore the indirect effects of conflicts and we focus on two different levels of aggregation. On one hand, we rest on firm level analysis, on the other hand, we extend our investigation to firm-to-firm relationships. In both cases, we aim at understanding whether a firm that is active in a non-conflict district can be affected by the exposition to conflicts experienced by their suppliers, customers or by their competitors.
In order to identify non-conflict districts, we follow two strategies. First, we consider just districts that over the whole period of our analysis have never recorded any hostile event. Second, we adopt a less stringent definition, by considering those district-year pairs that have not recorded any hostile event three years before and one year later, so within the time window between *t-3* and *t+1*.
By exploiting firm-to-firm transactions data, for each firm we then retrieve the set of suppliers and customers at time $t-1$. We build upstream and downstream measures based on a firm's input-output network in $t-1$ before the conflict shock as the exposure to conflicts could indeed change the existing relationships among firms.
By combining the input-output network of each firm together with conflict exposure of all suppliers, we end up with the following measures of upstream conflict exposure:

$$Confl_{idt}^{Supplier} = \sum_{j \in \Theta_{i,t-1}^{SUPP}} sh\_input_{ijt-1} Confl_{jdt}$$

where $Confl_{jdt}$ is defined as above for a firm j which is now a supplier of firm i at time $t-1$. $\Theta_{i,t-1}^{SUPP}$ is the set of suppliers of firm i at time $t-1$, sh_input_{ijt-1} is the share of input that firm i buy from a supplier j. We build the upstream conflict exposure by alternatively considering all the suppliers of a firm, only its main suppliers - i.e. those accounting for at least 5% of a firm i's purchases-, manufacturing suppliers and main manufacturing suppliers. In a similar way, we build a measure for downstream conflict exposure as follows

$$Confl_{idt}^{Customer} = \sum_{j \in \Theta_{i,t-1}^{CUST}} sh\_output_{ijt-1} Confl_{jdt}$$

where $\Theta_{i,t-1}^{CUST}$ is the set of customers of firm i at time $t-1$ and sh_output_{ijt-1} is the share of output that firm i sell to customer j, while the remaining variables are defined as above.

We then test the above measures in the following firm level regression which is implemented on firms active in non-conflict districts:

$$y_{idt} = \alpha + \eta Confl_{idt}^{Upstream} + \chi Confl_{idt}^{Downstream} + \delta X_{idt-1} + \phi_i + \gamma_{st} + \lambda_{pt} + \epsilon_{idt} \quad (2)$$

The empirical model is very similar to equation 1, but instead of testing for the occurrence of conflicts in firm i's main district that for non-conflict district is equal to 0 by construction, our interest lies on coefficients associated with $Confl_{idt}^{Upstream}$ and $Confl_{idt}^{Downstream}$ which will detect whether the negative impacts of conflicts propagate along the input-output network.

As a further step of the analysis, in order to better dig into these indirect effects, we move to bilateral relationships and we explore how firm-to-firm linkages are affected by the conflict exposure of one of the two contracting parts. More specifically, by focusing on firms in non-conflict districts, we test whether their business linkages with suppliers are affected by the latter's exposure to conflicts. So, we estimate

$$purchases_{ijt} = \alpha + \kappa sh\_purchases_{ijt-1} + \beta Confl_{jt} + \delta X_{it-1} + \chi Z_{jt-1} + \phi_{ij} + \gamma_{s_it} + \eta_{s_jt} + \epsilon_{ijt} \quad (3)$$

where $purchases_{ijt}$ represents the total purchases of the manufacturing firm i from supplier j at the time. Firm i is not directly exposed to conflicts. The variable of interest is $Confl_{jt}$ which is the supplier j's exposure to conflicts. $sh\_purchases_{ijt-1}$ is the share accounted for by supplier j in firm i's total purchases at time $t-1$. We control for pair (panel) fixed effects, ϕ_{ij}, and for a number of variables of both firm i, X_{it-1}, and firm j, Z_{jt-1} at time $t-1$. Finally, we add buyers' and suppliers' 4-digit sector-year fixed effects, γ_{s_it} and η_{s_jt}. We then implement a similar empirical model when considering firms acting as suppliers and testing for the impact of buyers' exposure to conflicts. The estimated equation will be equal to 3 where i will refer to a firm which sells inputs to firm j, that, thus, represents the buyer in the bilateral relationship.

In both cases, we will test whether there are heterogeneous effects according to the elasticity of substitution that characterizes the product traded, the geographical distance between the two contracting parties and the length of their relationships (over a five year time span).

3.4.2 Indirect effects: competition

Finally, we test whether firms located in non conflict areas could take advantage from the conflict exposure of their customers' suppliers. Indeed, customers could face problems in sourcing inputs from supplying firms that are located in districts that experience an upsurge of conflicts. It follows that they could turn to other existing (or even new) suppliers located in non conflict area. The latter, thus, would increase their market share.
In order to detect whether the effects of a conflict could propagate through this competition channel, we proceed as follows. We consider all manufacturing firms located in non conflict districts and we identify their sales relationships with all customers that are also located in non conflict districts. We then test whether the bilateral relationships of firms are affected by the exposure to conflicts of their buyers' suppliers.
The empirical model we estimate is the following

$$sales_{ijt} = \alpha + \kappa sh\_sales_{ijt-1} + \beta Confl_{jt}^{Upstream,s_i} + \delta X_{it-1} + \chi Z_{jt-1} + \phi_{ij} + \gamma_{s_it} + \eta_{s_jt} + \epsilon_{ijt} \quad (4)$$

where $Confl_{jt}^{Upstream,s_i}$ measure the exposure to conflicts of firm j's suppliers that are active in the same 4-digit NACE sector s_i as firm i. In the computation of this variable we consider the input-output linkages in t-1, as done in section 3.4.1. We then identify a firm i's competitors as all firms active in the same sector that are suppliers of the same customer.
All other variables are defined as in equation 3. However, differently from equation 3 both firm i and j are located in non-conflict districts, so $Confl_{jt}$ that was tested above is now equal to 0 by construction.
By focusing on both suppliers and customers that are not directly exposed to hostile events, we want to detect the propagation of the conflict effect through the competition channel by isolating this mechanism from other channels.
When we analyse firm-to-firm relationships, in order to exclude very marginal and tiny exchanges among firms, we consider those relationships that account for at least 1% of the buyer's purchases or 1% of the customer's sales.
We also restrict our analysis to those bilateral relationships that last at least 3 years.

3.5 Indirect Effects of Local Conflicts - Empirical Results

Table 5 shows estimates from model 2 to assess the second order effects of local conflicts. The Table shows that the main propagation effects are driven by conflicts affecting a firm's suppliers in another district. This is especially valid if conflicts in other districts affect a firm's major suppliers, that is, suppliers that count 5% or more than the firm total purchases.
Columns [1] and [2] Table 6 shows the results from the estimation of the bilateral model 3 where conflicts affecting each supplier j are directly tested as a determinant of purchases of firm i, located in a peaceful area, from the same supplier. Columns [3] and [4] replicate the same model for firm i's sales to customer j. In both cases we confirm a negative nexus, working through input-output linkages, between the occurrence of local conflicts in a district and the economic activity of firms in peaceful areas.

Competition spillover effects As a further exercise we inspect whether the exchanges between firms in peaceful areas are anyway affected by local conflicts occurring somewhere else in the country. In table 7 we find that sales of supplier i located in a peaceful area to buyer j located in another peaceful area are positively affected by the occurrence of conflicts affecting buyer i's suppliers that are active in the same 4-digit industry as supplier i. This implies a strengthening of economic ties between and within peaceful regions which could hamper the detrimental direct effects of local conflicts.

3.6 Product, relational and geographical heterogeneity of the effects

To be drafted

4 Conclusions

To be drafted

Table 5: The indirect impact of local conflicts on firm sales through input and output relations

	Firms in sample between t-3 and t+1					
$Confl^{-10\ Major\ Customers}$	-0.006		-0.005			
	[0.006]		[0.006]			
$Confl^{-10\ Major\ Suppliers}$		-0.022***	-0.020**			
		[0.008]	[0.008]			
$Confl^{-10\ All\ Customers}$				-0.005		-0.003
				[0.006]		[0.006]
$Confl^{-10\ All\ Suppliers}$					-0.022***	-0.020**
					[0.008]	[0.008]
Observations	377,728	377,426	374,409	377,728	377,426	374,409
R-squared	0.860	0.859	0.860	0.860	0.859	0.860 [b]
	Firms located in no-conflict districts					
$Confl^{-10\ Major\ Customers}$	-0.011		-0.009			
	[0.007]		[0.007]			
$Confl^{-10\ Major\ Suppliers}$		-0.022**	-0.019*			
		[0.010]	[0.010]			
$Confl^{-10\ All\ Customers}$				-0.007	-0.008	
				[0.007]	[0.007]	
$Confl^{-10\ All\ Suppliers}$				-0.018*		-0.021**
				[0.010]		[0.010]
Observations	248,770	248,591	246,464	246,464	248,770	248,591
R-squared	0.846	0.846	0.847	0.847	0.846	0.846 [b]

*** p<0.01, ** p<0.05, * p<0.1. Standard errors are displayed in brackets and are clustered by firm. The dependent variable is the log of real sales. All specifications include the the following firm level controls all measured at t-1: the log of employment, real value added per worker, real wage, capital per unit of labour, number of customers and suppliers, export and import dummy variables. Firm, industry-year and province-year fixed effects are included in each specification.

Table 6: The direct impact of local conflicts on firm sales

	[1]	[2]		[3]	[4]
$purchases_{t-1}$	0.607***	0.607***	$sales_{t-1}$	0.653***	0.653***
	[0.013]	[0.013]		[0.014]	[0.014]
$Confl^{-10\ Supplier}$	-0.009		$Confl^{-10\ Customer}$	-0.017**	
	[0.007]			[0.007]	
$Confl^{-10/-8\ Supplier}$		-0.013**	$Confl^{-10/-8\ Customer}$		-0.013**
		[0.006]			[0.006]
Observations	818,970	818,970	Observations	734,859	734,859
R-squared	0.875	0.875	R-squared	0.897	0.897 [b]

*** p<0.01, ** p<0.05, * p<0.1. Standard errors are displayed in brackets and are clustered by pair.
All specifications include the the following firm level controls all measured at t-1: the log of employment, real value added per worker, real wage, capital per unit of labour, number of customers and suppliers, export and import dummy variables. Firm, industry-year and province-year fixed effects are included in each specification.

Table 7: The direct impact of local conflicts on firm sales

	[1]	[2]
$sales_{t-1}$	0.903***	0.903***
	[0.041]	[0.041]
$Confl^{-10\ Other\ Suppliers}$	0.101**	
	[0.049]	
$Confl^{-10/-8\ Other\ Suppliers}$		0.090**
		[0.038]
Observations	84,518	84,518
R-squared	0.920	0.920 [b]

*** p<0.01, ** p<0.05, * p<0.1. Standard errors are displayed in brackets and are clustered by pair.
All specifications include the the following firm level controls all measured at t-1: the log of employment, real value added per worker, real wage, capital per unit of labour, number of customers and suppliers, export and import dummy variables. Firm, industry-year and province-year fixed effects are included in each specification.

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