The Value of Relationships: Evidence from a Supply Shock to Kenyan Flower Exports

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November 2010‡

- Preliminary & Incomplete: comments welcome! -

Abstract

When contracts are incomplete firms facilitate trade by developing relationships in which future rents deter short-term opportunism. We study how future rents assure contractual performance in the Kenya flower export sector. Based on revealed preferences we compute a lower bound to the value of these rents for the exporters: the value of a relationship must be greater or equal than the revenues foregone by not selling on the spot-market at higher prices. Controlling for buyer and seller fixed effects, we show that at a time of a large, negative and unanticipated supply shock induced by an intense episode of ethnic violence, exporters prioritize the most valuable relationships. In turn, compliance at the time of the shock positively correlates with relationship survival, future trade volumes, prices and relationship value. Interpreted under the light of models of 1) informal insurance, 2) relational contracting and 3) reputation, the evidence appears to be most consistent with the predictions of reputation models. Policy implications are discussed.

Keywords: Relational Contracts, Reputation, Reliability, Spot Market, Ethnic Violence.

JEL Codes: F14, F23, L14, O13, Q17.

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‡This research would have not been possible without the collaboration of many people in the Kenyan flower industry and the help of staff at the Steadman Group in Nairobi. We thank them all. We also thank Pol Antras, Oriana Bandiera, Abhijit Banerjee, Tim Besley, Nick Bloom, Robin Burgess, Lorenzo Casaburi, Arnaud Costinot, Stefan Dercon, Marcel Fafchamps, Raquel Fernandez, Greg Fischer, Maitreesh Ghatak, Bob Gibbons, Asim Khwaja, Beata Javorcik, Clare Leaver, Niko Matoushek, Marc Melitz, Torsten Persson, Imran Rasul, Antoinette Schoar, Tavneet Suri, Steve Tadelis, Dan Trefler, Fabian Waldinger, Chris Woodruff and seminar and workshop participants in Barcelona, Bocconi, Cambridge, Canazei, CSAE Oxford (2009), Dublin, Essex, EUDN (Sweden), Frankfurt, Harvard, LSE, MIT-Sloan, Munich, Namur, Nottingham, NYU, Oxford, Southampton, Tilburg, UCL, and Warwick for helpful comments and suggestions. Financial support from the iiG research programme, funded by the UK Department for International Development (DFID), is gratefully acknowledged. Ameet Morjaria would like to thank STICERD for a travel award, ESRC and C & J Modi / KR Narayan Fellowship Award for financial support.

1 Introduction

1. In the absence of enforceable contracts, LT relationships are important.

The ability to enter binding agreements is recognized as an essential ingredient for the expansion of markets, trade and economic development (see, e.g., Greif (2005)). In many markets, however, formal contract enforcement is not available: this can occur because formal institutions either do not exist or are not effective, or because third-party enforcement is prohibitively costly. Trading parties then, rely on informal enforcement mechanisms to guarantee contractual performance. Among those mechanisms, long-term relationships based on trust or reputation are perhaps the most widely studied and have received enormous theoretical attention.

2. Theoretical Literature presents a large class of models to study LT Relationships.

The theoretical literature presents many different models to study how long-term relationships can help deter short-term opportunism. The literature is large and often different authors refer to similar concepts using different terminology (for reviews, see, e.g., Bar-Isaac and Tadelis (2008), Cabral (2006), Mailath and Samuelson (2006)). An important distinction emerges between models based on self-enforcing agreements, or *trust*, e.g., Klein and Laffer (1981), Shapiro (1982), Bull (1987), MacLeod and Malcomsom (1989), Kranton (1996), closely related to the legal concept of relational contracting (see Macneil (1978), and, more recently, Baker, Gibbons, and Murphy (2002) and Levin (2003)), versus models based on *reputation*, e.g., Kreps and Wilson (1982), Diamond (1989) and Holmstrom (1999), Mailath and Samuleson (2006). To clarify, the notion of trust is based on hidden actions, i.e., trust is formalized as beliefs about what a player is *expected to do*. In trust models, incentives to deter short-term opportunism are created by attaching less favorable continuation outcomes following deviations. A part from this, the baseline trust model has a recursive structure: the continuation game following any history is identical to the original game. The notion of reputation, instead, is based on hidden types, i.e., reputation is formalized as beliefs about what a player is *expected to be*. The asymmetric information about a player's type introduces the possibility that, by playing frequently enough a certain action, a player can develop a reputation which induces expectations that she will continue play that action in the future. Short-term opportunism, then, is deterred by fear that it will lead to a worsening of the player's reputation. The two classes of model, therefore, share the common insight that future rents are necessary to deter short-term

opportunism.[1]

3. These Approaches share common insights, but differ in important respects.

The models, however, differ in other important respects. In models of trust, for example, the link between past behavior and expectations of future behavior is an equilibrium phenomenon, which holds in some equilibria but not in others. In models with types, instead, the incomplete information introduces an intrinsic connection between past behavior and expectations of future behavior. Reputation models, therefore, imply a causal link between a relationship's age, or the frequency of past play, and contractual outcomes which is not necessarily implied by trust models. The models also differ with respect to the potential externalities that relationships impose on each other: the availability of alternative partners typically undermines the viability of relationships in models of trust, while the opportunity to acquire or maintain a good reputation with a given partner might enhance the ability to sustain a good reputation with a different one. It is therefore important, not least from a policy perspective, to assess the empirical relevance of the different types of models.

4. While it is important to empirically distinguish models, progress has been difficult.

Empirical progress in the area, however, has been hindered by several difficulties. First, dataset containing information on transactions between firms are relatively rare. Second, trust and reputation are embedded in beliefs held by contracting parties. These beliefs are typically unobservable, and therefore the future rents generated by a relationship have been proxied with product, firm, or market characteristics, typically measured in a cross-section. The empirical literature, furthermore, has also focused in testing the predictions of a model at the time, without trying to distinguish across models.

5. Why Flowers? Why Exports? Why Kenya? Unique Adavnatges of our Settings

This paper attempts to make empirical progress in the area by studying relationships between exporters of Kenyan flowers and Foreign wholesalers. There are several unique features that, we believe, make this particular market an ideal laboratory to empirically study long-term relationships between firms. First, a survey we conducted

[1] Because of the empirical setting under consideration, the paper will also consider a third class of models that study informal insurance under limited commitment using recursive contracts techniques (see, e.g., Thomas and Worrall (*various*) and Khocharlakota (1996)). In these models, future rents are embedded into time-consistent promises that follow the history of a relationship. See Section 3 for details.

among producers in Kenya reveals that the relationships with foreign buyers are not governed by written contracts enforceable by courts. This has to be expected, since the perishable nature of flowers makes it unpractical to write and enforce contracts on supplier's reliability. Upon receiving the flowers, the buyer could refuse payment and claim that the flowers sent were not of the appropriate variety and/or did not arrive in good conditions while the seller could always claim otherwise. The resulting contractual imperfections, exacerbated by the international nature of the transaction, imply that firms must rely on repeated transactions, trust and reputation to assure good contractual performance.

Second, in the flower industry, long-term relationships coexist alongside a well-functioning spot market, the Dutch Auctions.[2] Because of the seasonality inherent to the flower industry, prices on the sport market are sometime higher than prices received from direct buyers, which tend to be more stable throughout the season. The spot-market, therefore, provides a reference price that can be used, through a revealed preference argument, to compute a lower bound to the future rents exporters derive from a relationship.

Third, focusing on an export market provides the further advantage that, unlike domestic sales, export sales are administratively recorded by the customs. We can therefore perform our analysis on a transaction-level dataset of all exports of flowers that contains the exact names of sellers, buyers, as well as information on units traded, prices and date. Finally, the particular setting of our study, Kenya, presents two further advantages. First, essentially all flower production in Kenya is destined to the export markets: we, therefore, observe in the dataset the entire industry sales. Second, a large, unanticipated, negative supply shock induced by an intense episode of ethnic violence provides a unique opportunity to test competing models of relationships.[3]

[2] Historically, flowers have been traded at the Dutch auctions, a form of exchange that is as close as it gets to the perfectly competitive market of microeconomics textbooks. The "Dutch auction", also known as "clock auction", is named after the flower auctions in the Netherlands. A Dutch auction is a type of auction where the auctioneer begins with a high asking price which is lowered until some participant is willing to accept, and pay, the auctioneer's price. This type of auction is convenient when it is important to auction goods quickly, since a sale never requires more than one bid.

[3] Following heavily contested presidential elections in Kenya at the end of December 2007, several regions plunged into intense episodes of ethnic violence leading to the death of more than a thousand and the displacement of several hundred thousand people. Flower exporters located in regions where conflict occurred suddenly found themselves lacking significant proportions of their labor force. In an industry that employs workers trained to perform highly specialized tasks to ensure timely deliveries of flowers to foreign markets and buyers, the ethnic violence was a major unanticipated negative short-run supply shock which induced a dramatic drop in exports of flowers. Ksoll et al. (2010) find that at the average firm in the conflict region 50% of the labor force was missing and exports volumes dropped by 38%.at the pick of the violence.

6. Summary of Findings

6.1 Relationships Value before the Violence

The empirical analysis follows the temporal structure in the data. First, we compute a measure of (a lower bound to) the net present value of the future rents associated with each relationship in the season *before* the eruption of the violence. The central idea is that the net present value of the future rents associated with a relationship must be large enough to compensate the exporters for not side-selling to the spot market at higher prices.[4] Using this revealed preference argument; a lower bound to the net present value of the future rents associated with a relationship can be calculated using only information on quantities transacted, FOB prices in the relationships and auction prices; which are all observable in the data. Controlling for buyer and seller fixed effects, we find that the estimated relationship value positively correlates with the age and past amount of trade in the relationship.

6.2 At the Time of the Violence Firms Prioritize more Valuable Relationships

At the time of the violence, exporters located in the region directly affected by the violence could not satisfy the commitments they had with all their buyers. The violence was a large shock and exporters had to chose which buyers to prioritize. We find that, controlling for buyer and seller fixed effects, exporters prioritized the most valuable relationships. As a consequence of this, the violence destroyed some of the least valuable relationships.

6.3 Supply During the Violence Correlates with Future Relationship Outcomes

In turn, the demonstrated reliability at the time of the violence correlates with future outcomes in the relationships. Controlling for both buyer and seller fixed effects, we find that reliability in volumes at the time of the violence positively correlates with the likelihood of relationship survival, with higher volumes of trade, higher prices and higher future values of the relationship in the season following the violence. Furthermore, the positive correlation between reliability at the time of the violence and relationship outcomes is robust to controlling for the value of the relationship as estimated before the violence.

6.4 Copying with the Violence

Finally, we provide some evidence that firms could take action to mitigate the negative effects of the violence and try to maintain a steady supply towards their

[4] The argument is formally derived within the framework of a stylized model presented in the Appendix.

foreign buyers. In particular, firms heavily prioritized shipments to direct buyers with whom they have long term relationships over shipments to the Dutch Auctions, where they do not have contractual obligations.[5] While this fact is consistent with the previous findings, after all, by definition, the value of the "relationship" with the spot market is zero, two features make the finding interesting. First, because of the seasonality inherent to the flower industry, prices on the sport market at the time of the violence were higher than prices received from direct buyers. Second, prices in direct relationships were not renegotiated upward at the time of the violence.

7. Interpretation of the Findings

The results described above should not be interpreted causally. While the negative supply shock was exogenous to the firm, the decision of which relationship to prioritize clearly is not. Nevertheless, the correlation patterns observed in the data provide enough information to distinguish across competing classes of models. In particular, we interpret the findings as being relatively more consistent with a model emphasizing the importance of a seller's reputation for reliability. The strong correlation between the past history and the future value of the relationship is, as noted above, an explicit feature of all reputation models. Furthermore, the fact that the measure of reliability at the time of the violence correlates with a strengtening of the relationship in the season following the violence, is consistent with models that are essentially non-stationary. The result on prices, in particular, is consistent with reputation models in which buyers pay a premium when dealing with suppliers with higher reputation.[6]

8. Structure of the Paper

The rest of the paper is organized as follows. Section 2 discusses the related empirical literature. Section 3 discusses the theoretical predictions of models of trust and models of reputation. The section also discusses recursive contracts models of insurance which might be relevant to interpret empirical patterns in the context of the flower industry. Section 4 provides some background on the industry, the contractual practices, and the ethnic violence. Section 5 presents the empirical results. After a description of the relationships in the sample, Section 5.1 computes the value of the relationships in the sample. Section 5.2 study how relationships responded to, and

[5] Note that, regardless of final destination, i.e., direct buyers vs. Dutch Auctions, firms transport flowers to the airport on trucks they own and at the same time of the day. The logistic operations were, therefore, equally affected by the violence across the two contractual forms.

[6] Note also that the dynamic evolution of estimated relationship values, the fact that firms prioritize more valuable relationships and the lack of price renegotiation at the time of the violence are inconsistent with recursive contracts models of informal insurance.

were affected by, the shock, paying particular attention to future outcomes. Section 5.3, provides evidence that firms prioritized direct relationships over the spot market. Finally, Section 6 interprets the evidence in light of the theoretical models discussed in Section 3, discusses policy implications and offers some concluding remarks. An Appendix formally derives the strategy to compute the value of the relationship in the context of a stylized theoretical framework and provides further information on the data.

2 Related Empirical Literature

This Section relates the findings of the paper to the empirical literature on relationships between firms. McMillan and Woodruff (1999), Banerjee and Duflo (2000), and Macchiavello (2010) are the most closely related contributions and also share with the current paper a developing country setting. In an environment characterized by the absence of formal contract enforcement, McMillan and Woodruff (1999) find evidence consistent with long term informal relationships facilitating trade credit. Banerjee and Duflo (2000) infer the importance of reputation by showing that a firm's age strongly correlates with contractual forms in the Indian Software industry. There are two important differences between these papers and ours. First, both McMillan and Woodruff (1999) and Banerjee and Duflo (2000) rely on cross-sectional survey evidence and cannot control for unobserved firm, or client, heterogeneity. In contrast, we exploit an exogenous supply shock and rely on "within relationship" evidence to prove the existence, study the source, and quantify the importance of the future rents necessary to enforce the implicit contract. Second, we focus on prices and export volumes as contractual outcomes. Macchiavello (2010) studies learning effects in new markets using a twenty years panel of relationships between Chilean wineries and distributors in the UK. Controlling for relationships fixed effects, he documents that exporters entering a new market capture an increasing fraction of the surplus generated by their relationship with foreign distributors as their reputation improves. While both papers find evidence consistent with reputation and trust being quantitatively important determinants of export performance, they differ with respect to the methodology used as well as the time horizon covered by the analysis. Banerjee and Munshi (2004), Andrabi et al. (2006), and Munshi (2008) provide interesting studies of contractual relationships in a development context, but with rather different focus. For example, Munshi (2008) and Banerjee and Munshi (2004) provide evidence on the trade enhancing role of long

term relationships based on community ties. Andrabi et al. (2006) provide evidence of how flexible specialization attenuates hold-up problems.

Alongside a larger literature that studies explicit contract terms between firms (see, e.g., Lafontaine and Slade (2009) for a survey), some studies have focused on the relationship between informal enforcement mechanisms based on reputation, or repeated interaction, and formal contract choice (see, e.g., Corts and Singh (2004), Kalnins and Mayer (2004), and Lyons (2002)). These papers, however, also rely on cross-sectional data and do not attempt to separate the effects of past and previous anticipated interactions. In this respect, Gil and Marion (2009) is most closely related to our paper. In the context of public procurement, they show that a larger stock of prior interactions between contractors and subcontractors normally leads to lower prices and higher likelihood of participation in the auctions but that this relationship does not arise at times and areas with little future contract volume, suggesting the importance of the self-enforcing mechanism. Finally, Brown et al. (2004, 2009) study the role of self-enforcing agreements and reputation in facilitating trade with the help of controlled laboratory experiments.[7]

3 Theoretical Frameworks

– Preliminary and Incomplete –

This section will (informally) discuss:

1. Models of trust: [no explicit link between past and future, stationary environment],

2. Models of reputation: [explicit link between past and future, non-stationary environment]

3. Recursive contracts models of insurance [explicit link between past and future, but with ambigous predictions, non-stationary environment, because of insurance i) shock should be accommodated if more value is available, ii) prices should be renegotiated immediately].

[7] The paper is also related to a recent literature on intermediation and international trade (see, e.g., Rauch (1999), Kranton and Swamy (2007), Araujo and Ornelas (2007), Antras and Costinot (2009) for theoretical contributions, and Bernard et al. (2009) and Blum et al. (2009) for empirical ones). This literature has paid little attention to reputational issues in export markets. From a rather different perspective, there is a large literature in development studies and sociology that emphasizes the value of collaborative relationships with foreign buyers (see, e.g., Egan and Mody (1992) and Gereffi (1999)).

The evidence presented in Section 5 allows to distinguish the three (classes of) models.

4 Background: Contractual Practices in the Flower Industry and the Ethnic Violence in Kenya

This section provides background information on the contractual practices in the industry and on how the ethnic violence affected the industry. The data for the empirical analysis in this paper come from transaction-level customs data which contains the names of the exporting company as well as the name of the foreign buyer. This information allows us to build a panel of relationships with daily data on volumes and prices of flower transacted. The background Section, instead, largely relies on information that was collected with a representative survey of the Kenya flower industry that we conducted through face-to-face interviews in the summer of 2008. Further information about data sources is provided in Appendix.

The Flower Industry

Over the last decade, the Kenya flower industry has witnessed a dramatic success. The country has become one of the leading exporters of flowers in the world, overtaking traditional leaders such as Israel, Colombia and Ecuador. The flower industry is nowadays the largest foreign-currency earner for the Kenyan economy alongside tourism and tea. The Kenyan flower industry counts around one hundred and a handful of established exporters located at various clusters in the country.

Flowers are a fragile and highly perishable commodity. In order to ensure the supply of high-quality flowers to distant markets, coordination along the supply chain is crucial. Flowers are hand-picked in the field, kept in cool storage rooms at constant temperature for grading, then packed, transported to Nairobi's international airport in refrigerated trucks owned by firms, inspected and sent to overseas markets. The industry is labor intensive and employs mostly low educated women in rural areas. However, workers receive significant training in harvesting, handling, grading, packing, and acquire skills which are difficult to replace in the short-run.

Because of both demand (e.g. particular dates such as Valentines day and Mothers day) and supply factors (it is costly to produce flowers in Europe during winter), floriculture is a business characterized by significant seasonality. The business season starts in mid-august to early September when production and marketing plans are

negotiated with foreign buyers.

Contractual Practices

Flowers are exported in two ways: flowers can be sold in the Netherlands at the Dutch auctions or can be sold to direct buyers located in the Netherlands and elsewhere. The logistic operations associated with the export of flowers is the same across these two marketing channels and, therefore, within firms, the violence did not affect the logistic operations of the two marketing channels differentially.

The two marketing channels, however, differ dramatically with respect to the incentives structure. The Dutch auctions are as close as possible to the idealized Walrasian market described in textbooks. Each firm has an account at the auctions that allows them to sell flowers at any time. It is common practice in the industry to keep accounts at the auctions houses even for those firms that sell their production almost exclusively through direct relationships. The costs of maintaining an account are small, while the option value can be substantial. There are no contractual obligations to deliver particular volumes or qualities of flowers at any particular date. Upon arrival in the Netherlands, a clearing agent transports the flowers to the auctions where they are inspected, graded and finally put on the auction clock. Buyers bid for the flowers accordingly to the protocol of a standard descending price Dutch auction. The corresponding payment is immediately transferred from the buyer account to the auction houses and then to the exporter, after deduction of a commission for the auctions and the clearing agent. A part from consolidating demand and supply of flowers in the market aggregating over idiosyncratic shocks, the Dutch Auctions act as a platform that provides contract enforcement between buyers and sellers located in different countries: the Auction Houses certify the quality of the flowers sold and enforce payments from buyers to sellers.

Formal contract enforcement, in contrast, is missing in the direct relationships between the flower exporter and the foreign buyer, typically a wholesaler. The perishable nature of flowers makes it impractical to write and enforce contracts on supplier's reliability. Upon receiving the flowers, the buyer could refuse payment and claim that the flowers sent were not of the appropriate variety and/or did not arrive in good conditions while the seller could always claim otherwise. The survey we conducted among producers in Kenya does indeed reveal that relationships between exporters and foreign buyers are typically not governed by a written contract. Among the 74 producers we have surveyed, only 32 had a written contract with their main buyer. The majority of respondents did not have any written contract with their buyer. When

a contract is written, it is highly incomplete. Among the 32 firms with a written contract, less than a third had any written provision on the volumes, quality, and schedule at which flowers have to be delivered. Contracts rarely specify what happens at the end of the contract but sometime include clauses for automatic renewal. Some firms even report to have had a written contract only in the first year of their relationship with a particular buyer. With respect to volumes, written contracts might specify some minimum volume of orders year around to guarantee the seller a certain level of sales but very rarely include written clauses on the frequency of shipments. Contracts might, however, expressly allow for a relatively large percentage (e.g., 20%) of orders to be managed "ad hoc". With respect to prices, and regardless of whether the relationship is governed by a written contract or not, exporters negotiate them with buyers at the beginning of the season, from mid-august to early september. Most firms negotiate constant prices with their main buyer throughout the year but some have prices changing two times a year, possibly through a catalogue or price list. Contracts specifying prices indexed on the price prevailing at the Dutch auctions are not used. Contracts do not specify exclusivity clauses. In particular, contracts do not require firms to sell all, or even a particular share, of their production to a buyer or to not sell on the spot market. In principle, it would seem possible to write and enforce contracts that prevent firms from side-selling flowers at the auctions, at least for those buyers that have access to the spot market. The ability to sell on the spot market, however, gives producers flexibility to sell excess production as well as some protection against buyers defaults and/or opportunism. It is, therefore, not obvious whether contractual provisions preventing exporters from selling to the spot markets would be desirable.[8]

In summary, even though a significant minority of exporters has some kind of written agreement with foreign buyers, those contracts are highly incomplete. Furthermore, it seems unlikely that parties would go to a court to enforce it: in the words of one of our respondents, with a written contract "everybody knows what the expectations are so that the (written) contract turns out to be useless". Written contracts, therefore, seem to be used to set common "reference points", as in the recent work by Hart and Moore (2008), rather than to set the outside option that would be enforced by a court. The resulting contractual imperfections, exacerbated by the international nature of the transaction, imply that firms rely on repeated transactions and reputation to assure good contractual performance. The survey as well as the customs data

[8] Furthermore, such provisions, could be circumvented by selling on the spot markets through other exporters. In this regard, the interviews we conducted with exporters reveal that i) exporters do not sell, nor purchase, significant volumes of flowers to or from other exporters and ii) exporters perceive that it would be hard for most buyers to monitor a firm sales to other buyers or on the Dutch auctions.

reveal that often these are long term relationships. Several respondents reported to have had relationships longer than a decade, a quite remarkable fact in such a young industry.

Why do relationships coexist along-side a well functioning spot-market in this industry? A part from saving the freight costs of shipping flowers to the Netherlands and then, from the Netherlands, to the final buyer destination (e.g., Zurich, or Moscow), producers and buyers alike value the stability of prices and orders guaranteed by a well-functioning relationship. A buyer's commitment to purchase a pre-specified quantity of flowers throughout the season at pre-specified prices allow the producer to better plan production, sales and cash flows. Buyers, on the other hand, value having access to a reliable supply of flowers. For instance, buyers often offer menus of flower bouquets to their customers. These bouquets combine products sourced from different suppliers often located in different countries. Buyers, therefore, value maintaining regular availability of the products on their menus and accessing the spot market or alternative sources of supply at the last-minute can be very costly.

Short-Run Supply Shock

An intense episode of ethnic violence affected several parts of Kenya following contested presidential elections at the end of December 2007 and provides a short-run unanticipated shock to the production function of firms. The ethnic violence had two major spikes lasting for a few days at the beginning and at the end of January 2008. The regions in which flowers producers are clustered were not all equally affected. Figure 1 shows that only firms located in the Rift Valley and in the Western Provinces were affected by the violence while firms located in Athi River and North East of Nairobi were not. This classification of affected and unaffected regions is very strongly supported by the survey we have conducted in the summer following the crisis.[9] The main consequence of the violence was that suddenly the firms located in the regions affected by the violence found themselves lacking significant numbers of their workers. The sudden absence of significant shares of the labor force is a shock to the short-run supply curve of firms because workers in the industry are hired and trained at the beginning of the season (i.e., from September to December) to perform highly specialized tasks and cannot be replaced in the short run.

The survey we conducted in the summer reveals that workers absence has been a major problem for the firms located in the regions affected by the violence. Among

[9] Note that, since flowers are perishable and exported by large vertically integrated firms, it is possible to match each trasaction observed in the customs record to the exact time and location at which flowers are produced and exploit the spatial and temporal variation in the shock.

the 74 firms surveyed, 42 were located in regions that were directly affected by the violence. Table A1 illustrates responses. While firms located in regions not affected by the violence did not report any significant absence among workers (1%, on average), firms located in regions affected by the violence reported they had an average of 50% of their labor force missing during the period of the violence. Furthermore, firms were unable to replace workers. On average, firms in areas affected by the violence replaced around 5% of their missing workers with more than half of the firm replacing none. Many firms paid extra-hours to the remaining workers in order to minimize disruption in production.[10]

With so many workers missing, firms also suffered dramatic reduction in output. Figure 2 plots deseasonalized export volumes around the period of the violence for the two separate groups of firms relative to the previous season. The Figure clearly illustrates that the outbreak of the violence was a large and negative shock to the quantity of flowers exported by the firms in the conflict locations.

In the survey, we asked several questions about whether the violence had been anticipated or not. Not a single respondent among the 74 producers interviewed reported to have anticipated the shock (and to have adjusted production or sales plans accordingly): the violence has been a large, unanticipated and relatively short-run negative shock to the production function of firms.

5 Empirical Results

This Section presents the empirical results. After describing summary statistics for the baseline sample of relationships, we present the results in temporal order, as illustrated in Figure A1. We first compute lower bounds to the value of each relationship in the baseline sample combining the customs data with spot-market price information and show that the estimated value correlates with the age of the relationship. We then look at how shipments of flowers were affected by the ethnic violence. We create a measure of "reliability" at the time of the violence and show that exporters had to reduce shipments to their buyers and prioritized the most valuable relationships. Finally, we look at how relationships outcomes in the season that followed the violence correlate with the measure of reliability at the time of the violence and provide further results comparing shipments to direct buyers and to the spot market.

[10] Ksoll et al. (2010) provide further details on the ethnic violence and its overall impact on the industry and quantifies profit losses. Other costs, such as security and transportation, also increased but still remained small cost components.

Relationships Characteristics

Using the customs data, we build a dataset of relationships. Overall, we focus on the period August 2004 to August 2009, i.e., five entire seasons. The violence happened in January 2008, i.e., in the middle of the fourth season in the data, which runs from August 2007 to August 2008.

We define the baseline sample of relationships as those links between an exporter and a foreign buyer that were active in the period immediately before the violence. A relationships is active if the two parties transacted at least twenty times in the twenty weeks before the eruption of the violence, i.e., at least once a week on average. The data show clear spikes in the distribution of shipments across relationships at one, two, three, four and six shipments per week in the period under consideration. The cutoff is chosen to distinguish between relationships versus sporadic orders. Results are not sensitive to the choice of cutoff, however.

In total, this leaves us with 189 relationships in the baseline sample. Table 1 reports summary statistics for the relationships in the baseline sample. The average relationship had 60 shipments in the period from the beginning of the season until the week proceeding the violence. The average age of the relationship in the sample, measured as the number of days from the first shipment observed in the data, is 860 days, i.e., two years and a half. Immediately before the violence, contracting parties in the average relationship had transacted with each other 298 times. Note, however, that these figures are left-censored, since they are computed from the customs data from August 2004 onward. Since our records begin in April 2004, we are able to distinguish relationships that were new in August 2004 from relationships that were active before. Among the 189 relationships in the baseline sample, 44% are classified as censored, i.e., were already active before August 2004.

Relationships are not exclusive. While the Kenya flower industry counts around one hundred established exporters, only sixty have direct relationships with foreign buyers in our baseline sample. On average, therefore, exporters have three direct relationships. Furthermore, the baseline sample of relationships involves seventy buyers. The average buyer, therefore, has about two and a half Kenyan suppliers. This variation allows to study the economics of these relationship by controlling for both buyers and seller fixed effects.

5.1 Estimating the Value of Relationships

The Incentive Constraint

This Section uses the model described in Appendix A to estimate a lower bound on the value of a direct relationship for the seller. The basic set up of the model is as follows. Time is discrete, the buyer and the seller have an infinite horizon and discount the future at a common and constant rate. In each period, the cost of producing q units of flowers is given by $c(q)$, with $c'(\cdot) > 0$ and $c''(\cdot) > 0$, and the buyer always needs q^* units of flowers. Relative to the spot market, where prices oscillate between a "high season" followed by a "low season", with $p_s \in \{\underline{p}, \overline{p}\}$, a relationship is assumed, for simplicity, to save on transportation and intermediation costs.[11] Denoting with t_s the FOB price in the relationship during season s, a necessary, but not sufficient, condition for the relationship to be self-enforcing is

$$\delta \left(U_{s+1} - U^o_{s+1} \right) \geq q^*(p_s - t_s) \tag{1}$$

where U_{s+1} and U^o_{s+1} are the net present values of maintaining a good relationship by supplying q^* and compromising the relationship by side-selling on the spot market respectively. The incentive constraint for the seller (1) provides the foundation for the exercise. Specifically, the constraint says that the net present value of the future rents from the relationship is at least as large as the additional revenues the firm could get by selling on the auctions in the pick season. In general, the condition in (1) will not be sufficient to guarantee that the relationship is self-sustaining because side selling q^* on the market might not be the best deviation available to the seller. The right hand side of the constraint in (1), therefore, only provides a *lower bound* to the value of the relationship. The model in the Appendix formally shows that if the incentive compatibility constraint in the high season, i.e., when $p_s = \overline{p}$, is satisfied, then the corresponding constraint in the low season cannot be binding. In other words, only the maximum temptation to deviate has to be considered to obtain an estimate of a lower bound to the value of the relationship.

Empirical Implementation of the Incentive Constraint

From an empirical point of view, the appeal of the incentive constraint in (1) is that q^*, p_s and t_s are directly observable in the data and, therefore, no estimation is required to compute the lower bound to the value of the relationship during a given season. In particular, the proposed method does not rely on information on the cost structure of the firm, nor on expectations of future trade between the parties, which

[11] A source of relationship surplus is needed for any relational contract to be sustainable at all. To keep the model simple, we abstract from modeling other sources of surplus generated by relationships, such as insurance and reliability, that were discussed in the previous Section.

are typically unobservable and/or difficult to estimate.

In bringing the constraint to the data we need to choose a "deviation window", i.e., the length of the period of time during which the deviation is computed. For each relationship i, therefore, we compute the lower bound to the value of the relationship during season $\mathcal{S}$, as

$$\mathbf{V}_{i\mathcal{S}} = \max_{t \in \mathcal{S}} \left\{ \left(p_t - t_{i,t} \right) q_{i,t} \right\}, \tag{2}$$

where p_t is the price at the auctions in week t during season $\mathcal{S}$, $t_{i,t}$ is the unit price in relationship i in week t. The operator $\max_{\mathcal{S}}$ gives the highest temptation to renege during the season: the model clearly states that only the incentive compatibility constraint in the pick season is binding. In other words, $\mathbf{V}_{i\mathcal{S}}$ is the maximum amount of revenue foregone in any given week of the season by the firm by selling to the buyer at lower prices rather than selling on the spot market at higher prices.[12]

In the empirical specifications below, we normalize the value of the rents by either the yearly revenue generated by the relationship in season $\mathcal{S}$, i.e., $\mathbf{R}_{i\mathcal{S}} = \sum_{t \in \mathcal{S}} t_{it} q_{it}$, or by the average weekly revenues generated by the relationship during the season, $\mathbf{R}_{i\mathcal{S}_i} = \frac{1}{|S_i|} \sum_{t \in \mathcal{S}} t_{it} q_{it}$, where S_i is the number of weeks the relationship was active during the particular season. Denote by $\mathbf{V}^N_{i\mathcal{S}}$ the normalized measure.

The variation in the estimated values across relationships, therefore, comes from two sources. First, there is the seasonal variation in prices, $t_{i,t}$. Figure 3 shows that FOB Prices in Direct Relationships are more stable than prices at the auctions throughout the season. The Figure shows the weekly variation relative to the season mean of FOB prices in direct relationships and at the Auctions. The second source of variation, is the quantity of flowers transacted within the relationship at the time in which the one-shot temptation to renege on the relational contract was highest, $q_{i,t}$. Because prices in direct relationships are very stable during the season, when we normalize the estimated value by seasonal or average weekly revenues, this second source of variation greatly drives the estimated values.

For most relationships, the maximum temptation to deviate arises during the Valentine pick. Figure 4 shows that FOB Prices at the Auctions are highly predictable. A regression of the weekly price at the auction on week and season dummies explains 76% of the variation in prices in the three season preceding the violence period. This implies that the estimated value is not driven by surprises, i.e., by unexpectedly high prices. This is confirmed by Figure 5. The Figure shows that the number of relation-

[12] Since we are interested in a lower bound, we chose a relatively conservative deviation window of one week. Different choices lead to larger bounds that are very strongly correlated with the measure used in the text and do not affect the results.

ships dying in a given week does not correlate with the price at the Auctions in that week during the two season preceding the violence period. This is consistent with the fact that prices at the auctions are highly predictable. Regardless of whether week dummies are controlled for or not, the level of prices at the auctions do not predict the number of relationships dying. A regression of the number of relationships dying in a given week on week and season dummies explain 57% of the variation in relationship deaths. These two facts suggest that parties design the relational contract to "navigate" through the season, i.e., they agree on relatively stable prices and orders that provide enough rents to compensate from the short-run gains of deviating by selling on the spot market at higher prices.

The Estimated Values

For the 189 relationships in the baseline sample, Table 1 shows that the estimated values of the relationships in the season that preceded the violence was 10% (respectively, 331%) of the seasonal (respectively, average weekly) revenues in the average relationship. It is hard to provide a benchmark against which assess whether 10% of yearly revenues is a large number or not. From a theoretical point of view, under free-entry in the formation of relationships, initial sunk investments would dissipate the ex-post rents (see, e.g., Klein and Laffer (1981), Shapiro (1983)). Under free-entry, therefore, our estimate yield a lower bound to the fixed costs of starting a relationship and can be compared to estimates from structural models on the importance of fixed costs in export markets. Das et al. (2007) reports that in the Colombian chemicals industry, fixed costs of exports in each year represent 1% of the export revenues of the firm.[13]

Future Value and History of the Relationship

Figure 6 plots the distribution of the estimated lower bounds (in logs) for three different samples of relationships. The three samples are given by, relationships in the baseline sample that were active at the Valentine peak of the season prior to the violence, relationships in the baseline sample that were not active during the same period, and relationships that were active during the same period but that are not in the baseline sample since they did not survive until the violence period. The Figure

[13] The corresponding figure for the initial sunk costs is between 18 to 42%. It is worth stressing, however, that our estimates are a very conservative lower bound. Figures 4 and 5 suggest that the optimal time for the seller to deviate is at the beginning of the period in which prices at the auctions start being above prices in the relationship. The value of the rent should then be given by the (discounted) integral of the temptations to deviate over the corresponding weeks. For reasonable discount factors, this number is significantly larger than, but highly correlated with, the estimates reported above.

shows two patterns. First, the relationships that have survived have higher values than the relationships that did not. Second, young relationships had (mechanically) lower values than established relationships.

The latter fact, however, cannot be interpreted as evidence that the value of a relationship increases with age since, quite mechanically, the estimated value of a relationship that is too young to have gone through a seasonal pick will be low. It is however important to explore whether and, if yes, how, a relationship's value correlates with the history of the relationship since different models have different predictions on this relationship. Table 2, therefore, presents regression results between the value of a relationship and various measures of a relationship history. Among the sample of established relationships that were active in the season before the violence, the Table shows that the past history of a relationship positively correlate with the estimated relationship value. All the specification in the Table control for a dummy for whether the relationship is left-censored as well as seller and buyer fixed effects. The Table considers three different proxies for the past history of relationships: i) the age of the relationship (in days), ii) the number of previous transactions between the parties, and iii) the cumulative value of past temptations that the relationships has survived. All three measures positively correlate with the estimated value of the relationships. An horse-race between the three measure suggests that the cumulative value of past temptations is the best proxy for the history of the relationships.[14]

6 Relationships Under Attack: the Supply Shock

The previous section combined the custom records and prices on the spot market to provide a lower bound estimate of the value of the relationship for the seller. Since, despite the absence of written enforceable contracts, firms ship flowers to foreign buyers even when prices in the spot market are higher, exporters must derive future rents from the direct relationships with the foreign buyers. Controlling for both buyer and seller fixed effects, we found that the estimated value positively correlates with the age of the relationship.

To further understand the sources of value in the relationships and discriminate between competing theoretical models, this Section looks at how a large unanticipated

[14] The positive correlation between a relationship age and its value has to be interpreted cautiously. In particular, it is not possible to disentangle age from cohort effects out of cross-sectional data. Note, however, that the inclusion of buyer and seller fixed effects controls for contractual party cohort effects. Given that the industry is relatively recent, controlling for seller fixed-effects greatly reduces the concern that the correlation of interest is simply picking up relationship cohort effects.

supply shock affected the relationships. The section begins by constructing a measure of the "reliability at the time of the violence" towards each relationship. It then asks whether seller chose to prioritize more valuable relationships and if these choices correlate with future outcomes in the relationship.

Reliability at the Time of the Violence

While exporters might benefit from being able to plan for a relatively stable flow of orders and prices throughout the season, buyers value reliability too. Reliability allows buyers to satisfy orders from regular customers without having to rely on more costly and ad-hoc sources of supply, such as other wholesalers or even the spot market. Buyers also care about having the right mix of flowers in their stock at any particular point in time. For example, flowers bouquets in large supermarkets are assembled by large buyers that source the different types of flowers from different countries: lack of reliability from a particular supplier reduces the value of purchases from other suppliers as well and is, therefore, very costly for buyers. Because contracts cannot be enforced, developing and maintaining a reputation for reliability is a key concern for the exporters.

We exploit the regularity of shipments within direct relationships to construct a counterfactual measure of the volumes of flowers that should have been exported in a particular relationship during the time of the violence had the violence not occurred. In particular, we estimate a model that predicts shipments of flowers in a particular day, as a function of shipments in the previous three days, shipments in the same day of the week the previous week, and total shipments in the previous week. We fit the model separately for each relationship using the data from the beginning of the season until the week preceding the violence in all season in which the relationship was active. Note that, in so doing, we allow seasonality and weekly patterns to be relationship-specific. For each day, we obtain a predicted shipment of flowers within relationships. We aggregate these predicted value of flowers by week and confront the predicted shipments with the realized shipments. The model predicts more than 80% of both in sample and out of sample variation in weekly shipments for the average relationship.

Denote by y_{fb} the observed shipments of flowers in relationship between firm f and buyer b during the week of the violence, and by $\widehat{y}_{fb}$ the predicted shipments of flowers in the same relationship, obtained using the observed shipments in the week immediately before the violence and the coefficients from the model estimated above.

The measure of reliability at the time of the violence is given by

$$R_{fb} = \frac{y_{fb}}{\widehat{y}_{fb}}. \tag{3}$$

The measure R_{fb} captures the percentage of predicted shipments of flowers exported by a firm during the violence period to a particular buyer.

The first question that we need to address is whether the violence reduced "reliability". To answer this question, Table 3 reports results from the regression

$$R_{fb} = \alpha_b + \beta \mathbf{I}_f(C = 1) + \gamma Z_{fb} + \eta X_f + \varepsilon_{fb}, \tag{4}$$

where $\mathbf{I}_f(C = 1)$ is an indicator function that takes value equal to one if firm f is located in the region directly affected by the violence and zero otherwise; X_f is a vector of firm controls, Z_{fb} is a vector of relationship controls, and α_b are buyer fixed effects. To account for the fact that shocks to relationships that involve one or more common contractual parties might be correlated, the error term, ε_{fb}, is estimated through multi-way clustering at the firm and buyer level (see, Cameron et al. (2009)).

Because the conflict dummy is defined at the location level, the specification cannot control for exporter fixed effects. Note, however, that the reliability measure R_{fb} is a deviation from a relationships-specific counterfactual. The cross-sectional results derived from specification (4), therefore, are similar to a regression of volumes of exports $\widetilde{y}_{fb\tau s}$ at time τ in season s, on relationship-specific seasonality and season fixed effects, $\mu_{fb\tau}$ and μ_{fbs}, in which the effects of the violence are recovered from an interaction between a dummy for the period of the violence, $v_{\tau s}$, and a dummy for the conflict region, c_f. The controls included in specification (4), then, allow the violence period $v_{\tau s}$ to have affected export volumes $\widetilde{y}_{fb\tau s}$ differentially across buyers, sellers and relationship characteristics.

Table 3 shows that the violence reduced the ability of firms to maintain a regular supply to the foreign buyers. The Table reports results using different empirical specifications that differ in the number of controls included. In particular, in the last Column, which controls for buyer fixed effects as well as firm and relationship controls as in equation (4), we find that the estimated reliability was 15% lower, on average, in relationships involving firms located in the conflict region.

Did Exporters Prioritize More Valuable Relationships?

Because of the violence, firms located in the conflict region could not satisfy the entirety of orders from their buyers. The next question we ask is whether the value

of the relationship i between firm f and buyer b, estimated in the season before the violence, i.e., $\mathbf{V}^N_{i=fb}$, correlates with the reliability measure R_{fb}. Table 4 reports results from the regression

$$R_{fb} = \alpha_b + \mu_f + \beta \mathbf{V}^N_{fb} + \gamma Z_{fb} + \varepsilon_{fb}. \tag{5}$$

This specification is very similar to equation (4), but note that it now includes firm fixed effects μ_f. It is now possible to include firm fixed effects since we are not interested anymore in identifying the effects of the violence comparing firms located in different regions. Instead, we are interested in determining whether a particular firm, chose to prioritize different relationships given it was under the effects of the violence. Accordingly, regression (5) is estimated separately on the sample of firms located in the conflict and in the no-conflict regions.

Table 4 shows that exporters prioritized the most valuable relationships. Column 1 and 2 in the Table report the correlation between the measure of reliability at the time of the violence and the (lower bound to) the relationship value computed from the season before the violence in the sample of relationships of firms located in the conflict region. The two columns differ in so far as Column 2 also controls for buyer fixed effects. Controlling for seller fixed effects and for relationship characteristics, we find that the value of the relationship positively correlate with the observed reliability. Note that we use the value of the relationship normalized by the weekly average revenues and, therefore, the positive correlation is not simply picking up the fact that exporters prioritize larger relationships. Also, note that the value of a relationship is mechanically negatively correlated with the price received by the seller in the relationship. Hence, the correlation is not picking up the fact that exporters prioritize those relationships that pay higher prices at the time of the violence.

Furthermore, Column 3 and 4 use an alternative proxy for the value of the relationship which is given by the ratio of the shipment volumes at the time of the maximum temptation to renege over the average weekly shipment volumes. This measure does not rely on prices and captures how much the relationship can be "stretched" at the time of the maximum temptation to deviate. The results confirm the findings in Column 1 and 2.[15]

Finally, Column 5 and 6 repeat the same exercise for the baseline specification on the sample of relationships located in the no conflict region. As expected, the

[15] Consistently with these findings, results below show that firms stopped selling to the spot market, where their future value is, by construction, equal to zero. Furthermore, unreported results show that, even controlling for a relationship's value, a relationship age is still weakly correlated with reliability at the time of the violence.

results show that there is no correlation between the value of the relationship and the reliability in the region that was not affected by the violence.

Does Reliability Correlate with Future Relationship Outcome?

The violence made it difficult for firms to maintain regular shipments across the entire portfolio of direct buyers. Exporters, therefore, had to chose which relationships to prioritize and, as shown in Table 4, they prioritized the most valuable relationships.

We now turn to the question of whether the measure of reliability at the time of the violence R_i correlates with subsequent outcomes in the relationships. We focus on the period starting from the beginning of the following season, i.e., after mid august 2008. This is the time in which the contractual parties negotiate the marketing plans and contracts for the new season. We consider a variety of contractual outcomes: relationship's survival, volume of trade and prices, and estimates of the value of the relationship in the new season.

It is important to stress that the results of the exercise cannot be interpreted causally: while the negative supply shock was exogenous to the firm, a firm's reaction to the shock is not: the choice of which relationship to prioritize, if any, is an endogenous choice of the firm. In particular, firms might have chosen to prioritize those relationships in which they expected higher growth rates in either transacted volumes, prices or that they perceived to be more likely to survive. Nevertheless, the results can be used to discriminate among the different theoretical models discussed in Section 3.

Reliability and Relationship's Survival

Figures 7 begins with suggestive evidence on relationship survival. Figure 7 plots the distribution of reliability across the sample of relationships that did survive until the following season and those who did not, for relationships in the conflict region and in the no-conflict region separately. The Figure illustrates three facts. First, many more relationships did not survive in the conflict region, 16 out of 94, than in the no-conflict region, where the corresponding figure is 8 out of 95. Second, relationships that survived in the conflict region had higher reliability than those that did not survive. The difference in mean is statistically significant at the 3% level. Third, such a relationship between reliability at the time of the violence and relationship survival does not exist in the sample of relationships that were not directly affected by the violence.

Table 5 confirms these results. The Table shows that across the entire sample of relationships, and controlling for buyer fixed effects and relationship characteristics,

reliability at the time of the violence correlates with relationship survival. In particular, higher reliability reduces the likelihood of relationship's death in the conflict region, but does not in the no-conflict region. In other words: the conflict destroyed relationships, but only those towards which exporters have not been reliable. Consistently with this result, Figure 8 shows that, on average, the conflict destroyed relatively less valuable relationships in the conflict region, but not in the no-conflict region.[16]

Reliability and the Evolution of Volumes and Prices

Table 6 reports results on the volume of exports and average prices in the season following the violence on the sample of surviving relationships. All the specifications include buyer and seller fixed effects, as well as relationship controls. In particular, the specification controls for the value of the dependent variable in the corresponding period immediately before the violence. The results, therefore, are best interpreted as correlations between reliability at the time of the violence, R_{fb}, and growth in the dependent variable.

Column 1 shows that reliability at the time of the violence correlates with an increase in volumes in relationships of firms located in the conflict region. As mentioned above, the coefficient should not be interpreted in a causal way since exporters might have chosen to prioritize those relationships for which they expected larger increases in the volume of trade in the following season. Column 2 controls for the estimated value of the relationship before the violence. The logic of introducing this control is as follows. The value of the relationship is a forward-looking given by the expected net present value of the relationship in the future. The estimated value of the relationship immediately before the violence, therefore, might be able to control for the increase in trade volumes that was expected by the exporter at the time of the violence. The result is robust to the inclusion of the past estimated value. The evidence, therefore, is consistent with reliability at the time of the violence to have lead to an increase in the volume of trade in the relationship. Column 3, shows thet there is no relationship between reliability and increases in trade volumes in the season following the violence for the sample of relationships that were not directly affected by the violence. Finally, Columns 4 to 6 find the corresponding results with respect to increases in prices. Reliability at the time of the violence strongly correlates with increases in prices,

[16] These findings are apparently in contrast to Figure 6. However, in Figure 8 there is a gap of two years, rather than one, between the time at which the survival of the relationship is measured and whether the estimated relationship value. We report results in this way because the seasonal pick came after the violence and values measured at that time might confound medium-run effects of the violence.

regardless of whether the estimated value of the relationship before the violence is controlled for.[17]

Reliability and the Evolution of Relationship's Value

- TO BE ADDED -

7 Direct Relationships vs. Spot Market

In the previous Sections we have i) computed a measure of (a lower bound to) the value of each relationship and shown that such a measure correlates ii) with the age of the relationships and iii) with a firms reaction to a large negative shock. Furthermore, iv) the reaction to the shock correlates with future relationship outcomes. Consistently with any theoretical model of informal enforcement, it is the presence of future rents that prevents parties from deviating and obtain gains in the short-run.

If relationships are valuable, exporters should have tried to exert effort to maintain steady supply to their direct relationships during the time of the violence. In order to guarantee a steady supply of flowers to their direct buyers, exporters could have exerted effort in many different ways, incuding hiring security and organizing protection, paying their workers more to come the farm and work extra-hours, and so on. This Section focuses on a particular dimension of effort. It shows that during the time of the violence, firms prioritized exports towards direct buyers relative to exports to the spot-market.

Table 8 presents the results. For every firm in the industry, we construct a measure of reliability on the spot-market at the time of the violence following the same procedure described for the construction of the measure of reliability towards direct relationships. Column 1 shows that while suffering reductions in production because of the violence, exports volumes to the spot market drop significantly more than export volumes to direct buyers. In fact, export volumes to the spot markets drop by about 80%, while export volumes to direct relationships only drop by about 15%, consistently with what estimated in Table 3.[18]

[17] Unreported results show that these relationships are stronger among new relationships. The interaction coefficient, however, is not very precisely estimated.

[18] As noted above, the reported cross-sectional results on the reliability measure, are equivalent to a regression of the volumes of exports during the week of the violence, on relationship specific seasonality effects and a triple interaction between the type of marketing channels, conflict region and violence regions dummies. We consider two different controls to obtain a triple difference that controls for differential seasonality across marketing channels. Our data, furthermore, allow for two different identification strategies: one that uses the firm in the previous season as control, the other that uses

Column 2 focuses again on the set of direct relationships. Among firms that sell to direct buyers, some firm were also engaging in significant sales on the spot market immediately before the violence, while others were not. Column 2 shows that it is the direct relationships of those firms that were not selling to the spot market before the violence that face stronger declines in exports. In fact, the results show that all of the negative effect comes from those firms that normally do not sell to the auctions. The evidence, therefore, is consistent with the fact that firms have substituted shipments away from the auctions in order to maintain a steady flow of supply to their buyers. Firms that do not normally sell to the auctions did not have access to the buffer, and found it more difficult to maintain a constant supply to their customers. In other words, in risky environments the two marketing channels should be seen as complements, rather than substitutes. The evidence confirms that substituting shipments away from the auction was one of the effort dimensions along which firms could have adjusted shipments to direct buyers.[19]

Evidence on Prices

The results above show that firms have prioritized shipments to direct buyers over shipments to the spot market during the time of the violence. The result, per se, does not prove that firms derive future rents from maintaining supply to their direct buyers: if prices in the direct relationships are higher than prices on the spot market, firms could be simply minimizing current losses during the time of the violence.

Figure 9, however, clearly shows that this is not the case. The Figure reports the distribution of FOB prices in direct relationships at the time of the violence. The two vertical bars show the average prices prevailing at the Dutch auctions during the time of the violence for both small and large rose stems. The Figure shows that for a vast majority of relationships FOB prices were lower than prices on the spot market at the time of the violence. Combined with the results above, and with the absence of written contracts, the evidence shows that firms have foregone short-run gains in order to continue supplying to direct buyers: firms must derive future rents from maintaining those relationships.

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the no-conflict region as control group. The second strategy is the one followed in the text. The alternative strategy provides identical results.

[19] Ksoll et al. (2010) shows that, among the firms located in the regions affected by the violence, those that specialize in selling to direct buyers experienced a significantly smaller loss in *total* volume exported and lost a significantly lower proportion of workers during the conflict. The results control for many potentially confounding factors, including characteristics of a firm's labor force, such as education, gender, ethnicity, contract type and housing programs, as well as ownership type, certifications and size. The evidence is, therefore, consistent with the idea that firms engaging in direct relationships have exerted effort to keep their workers.

Figure 10 shows that FOB prices in direct relationships during the violence are very similar to those prevailing in the ten weeks before Christmas 2007, our control period. The available evidence, therefore, further suggests that prices in direct relationships were renegotiated upward at the time of the violence to (partially) incentivize suppliers to maintain a steady supply of flowers to the direct buyers: the future rents that firms derive from the relationships were sufficient to compensate for the foregone gains and increases in costs.

Further Evidence Supporting a Reputation Model

- TO BE ADDED -

8 Interpretation and Conclusions

Interpreting the Results

- PRELIMINARY AND INCOMPLETE -

As described in Section 3, the theoretical literature provides different frameworks to analyze long-term relationships. Subject to the several caveats we discuss below, we feel that the evidence presented in this paper is more supportive of models of reputation than of models of trust, or models of insurance.

The argument is as follows:

1. Evidence, espcially the explicit and persistent role of past interactions and the results on the correlation between future volumes, prices and values and reliability at the time of the violence, strongly points towards non-stationary models. This rules out (most) trust models,

2. Insurance models under limited committment are also non-stationary. However, these models seem to be inconsistent with i) firms prioritizing most valuable relationships and ii) the lack of renegotiation in prices at the time of the violence. Furthermore, the evolution of relationship values over time is also not very supportive of these models.[20]

[20] Finally, the lack of upward renegotiation in prices at the time of the violence is inconsistent with dynamic agency models with risk averse players. In these models incentives are provided through the right mix of future rents and current rewards and would, therefore, predict upward renegotiation in prices at the time of the violence.

The main caveats are as follows:

1. Strictly speaking, repeated game models can never be ruled out because of multiple equilibria,

2. Reputation models are problematic: reputation results are quite fragile and greatly depends on assumptions, with two long-lived players reputation results are even more fragile. Moreover, in reputation models incentives eventually die out, as uncertainty is resolved. Moroever, the theory lacks convincing models of committment types.

3. Argue in favor of "newer" non-stationary models of relationships, such as, Chassang (2010) or Matoushek and Wi (201?)

Conluding Remarks

Combining a transaction level database of exports of flowers with a negative shock to the supply curve of Kenya exporters induced by an episode of ethnic violence, we have provided quantitative evidence on the value of long term relationships in export markets. First we have documented that shipments of flowers during the violence behave as predicted by a large class of models of trade based on bilateral trust and reputation: exporters have forgone short-run gains to supply buyers with whom they have long term relationships. The result implies that exporters derive future rents from these relationships. The evidence suggests that a reputation for reliability is an important determinant of these rents. We have then used a theoretical framework to provide a lower bound to the value of the future rents necessary to sustain the relationship. We have found the lower bound to be worth at least 9% of the yearly turnover for the average relationship in the sample. Finally, we have documented that the rents are large enough to modify firms responses along important dimensions, other than export volumes. In particular, firms that export through relational contracting have exerted effort to keep larger shares of their labor force during the violence.

While derived in a special context, Kenya flowers exports during an episode of ethnic violence, the results yield several insights that are relevant in other contexts.[21] As it is well known, with the exception of primary commodities, most goods internationally traded are exchanged through direct relationships with foreign buyers, rather than in spot markets. Figure [**11**] plots the share of the value of a country exports in

[21] In the African context, unfortunately, episodes of ethnic related violence are not unusual. Moreover, several countries are pursuing active policies to encourage exports in non-traditional agriculture to diversify sources of foreign currencies.

commodities that are exported through direct relationships against per capita GDP in 2000.[22] The Figure shows that a larger fraction of exports from poorer countries, especially in Africa, is in non-differentiated commodities, i.e., commodities traded on spot markets. The paper provides strong evidence that contractual forms in export markets, i.e., *how* things are exported, has important economic consequences.

This paper has taken as given the existing contractual forms and, therefore, the results cannot be directly used to derive policy implications. Nevertheless, the results suggests potential complementarities between the two forms of exports, relational trade and spot markets. In environments prone to shocks, the two modes of organizing exports complement each other: while direct relationships provide value in the form of future rents, the spot market offers an option value which allows direct relationships to adjust to supply shocks.[23] Consistently with this intuition, the business association is encouraging exporters to further expand the use of direct relationships and to achieve a better balance in the distribution of sales across the two marketing channels.

The evidence of rents associated with long term relationships is consistent with the importance of entry costs in export markets. If the market equilibrium is characterized by free entry, initial sunk costs should compete away the rents associated with long term relationships, and, by implication, our estimates also provide a lower bound to the costs of starting new relationships. In contrast to credit and other forms of export subsidies, policies directed at lowering the costs of starting new relationships, such as common marketing and subsidizing attendance to international fairs and buyers visits to the country, might have the potential to alleviate those constraints only for those firms that would export, absent the market imperfections.

More broadly, a view that emphasize trust and reputation as an important determinant of comparative advantage can yield radically different policy implications. For this reason, it is important to empirically distinguish models of trust based on repeated interactions from models of reputation based upon beliefs on unobserved primitives of transacting parties. We see this as an exciting area for future work.

[22] Differentiated commodities are classified as commodities for which organized exchange or reference prices are not available (see Rauch (1999) for details). Exports of oil are not included in the calculation.

[23] The classic study by Newbery and Stiglitz (1982) shows that, in the presence of uninsurable supply shocks, price insurance might actually reduce producers welfare since incomes are in part automatically insured by downward sloping demand curves.

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9 Appendix A: Theoretical Framework

We introduce a stylized theoretical framework to guide the use of observable prices and volumes to derive a lower bound on the value of the relationship for the seller. The role of the relational contract is highlighted more clearly when a single supplier deals with a single buyer and courts can not enforce standard sales contracts. This last assumption is reasonable in the case of flowers since the high perishability of flowers makes it impractical to enforce contracts on the quantities and qualities to be delivered.

Set Up: Revenues, Costs and Markets

Time is discrete, the buyer and the seller have an infinite horizon and discount the future at a common and constant rate $\delta < 1$. In each period, the cost of producing q units of flowers is given by $c(q) = \frac{cq^2}{2}$.[24] The buyer derives revenues $R(q) = vq - \frac{(q-q^*)^2}{2} - k\mathbf{I}_{q\neq q^*}$ from procuring q units of flowers, where $\mathbf{I}_{q\neq q^*}$ is an indicator taking value equal to one if the buyer sources $q \neq q^*$ units of flowers in a given period. To capture the importance that buyers place on reliability, we assume that q^* is fixed and k is large enough so that it is always optimal for the buyer to source a constant amount of flowers q^* in each period.

Alongside the relationship between the buyer and the seller, there is a market, where the supplier can sell and the buyer can purchase unlimited quantities of flowers at given prices. For simplicity, let us assume that prices on this market oscillate across periods with a "high season" followed by a "low season" and so on. The supplier can sell flowers on the market at a price $p = \underline{p}$ in the low season and at a price $p = \overline{p}$ in the high season. The buyer can purchase flowers on the market at an additional intermediation cost τ, so that the price the buyer faces when the price on the market is $p' \in \{\underline{p}, \overline{p}\}$ is given by $p_b = p' + \tau$. To simplify, let $\underline{p} = 0 < \tau < \overline{p} = p < v$. It is easy to generalize the results to an arbitrary number of seasons and prices.

First Best Contracts

In the first best contracts are perfectly enforceable and the two parties maximize period by period the joint profits. Denote by q_s the quantity supplied by the seller to the buyer, q_a the quantity that the buyer procures on the market and by q_A the quantity sold on the market by the seller. We make the following parametric assumption:

Assumption 1: $k > \frac{1}{2}\frac{(v-cq^*)^2}{1+c}$, and $q^* < \frac{\tau}{c}$.

[24] This cost function can be derived from a model in which the firm trains L workers at the beginning of the season and, for a given amount of workers L, extra production can be obtained by increasing hours per worker. Under increasing marginal cost of hours worked, the marginal cost c is a decreasing function of the labor force L.

The first assumption implies that, in equilibrium, $q^* = q_a + q_s$, i.e., the buyer sources a quantity q^* of flowers in each period. When this is the case, the optimal sourcing and production decisions when the price on the spot market is p solve the following problem

$$\max_{q \equiv [q_s, q^A]} vq^* - (p+\tau)(q^* - q_s) + pq_A - \frac{c(q_s+q_A)^2}{2}.$$

Denoting by $\underline{q}$ and $\overline{q}$ the solution vector in the high and low season respectively, we have the following Lemma,

Lemma 1 *Under Assumption 1 the optimal sourcing policy is given by*

$$\underline{q} = \begin{cases} q_s = q^* \\ q_a = 0 \\ q_A = 0 \end{cases} \quad \textit{and} \quad \overline{q} = \begin{cases} q_s = q^* \\ q_a = 0 \\ q_A = \frac{p}{c} - q^* \end{cases}$$

in the low and high season respectively.

Proof of Lemma 1

When $p = \underline{p}$, then obviously $q_A = 0$. Under Assumption 1, the interior solution is given by the first order conditions

$$\begin{aligned} v &= (q_a + q_s) - q^* + cq_s, \\ v &= (q_a + q_s) - q^* + \tau. \end{aligned}$$

This gives $q_s = \frac{\tau}{c}$, and $q_a = v - \tau + q^* - \frac{\tau}{c}$. Denote the associated joint profits by $\Pi^q_{p=0}$. This sourcing policy needs to be compared with sourcing q^* directly from the buyer and setting $q_a = q_A = 0$, which gives joint profits $\Pi(\underline{p}) = vq^* - \frac{c(q^*)^2}{2}$. By Assumption 1, we have $\frac{\tau}{c} < q^*$, which implies $\Pi(\underline{p}) > \Pi^q_{p=0}$ if $k > \frac{(v-\tau)^2}{2}$.

When, instead, the price at the auction is $p = \overline{p}$, the optimal strategy is to set $q_a = 0$, $q_s = q^*$ and $q_A = \frac{p}{c} - q^*$, which gives profits equal to $\Pi(\overline{p}) = (v-p)\,q^* + \frac{p^2}{2c}$. The alternative interior solution gives $q_s = v - p + q^*$, and $q_A = \frac{p}{c} - (q^* - (p-v))$. This implies profits $\Pi^q_{p=\overline{p}} = \frac{(v-p)^2}{2} + \frac{p^2}{2c} + q^*(v-p)$, which are smaller than the assumed optimum if $k > \frac{(v-p)^2}{2}$. This is guaranteed by Assumption 1 combined with $p > \tau$.■

Assumption 1 guarantees that the model captures well established practices in the industry. Since $\tau > 0$, the marginal benefit of selling to the auction is always smaller

than the marginal cost of procuring on the auction. So, if $q_A > 0$, it must be that $q_a = 0$ (and viceversa). The optimal sourcing policy, therefore, entails a constant order flow q^* from the buyer to the seller throughout the season. This is because k is large enough so that it is never optimal for the buyer to source a quantity different from q^*. Sales to the spot market, instead, fluctuate through the season. In the low season, the assumption $q^* < \frac{\tau}{c}$ guarantees that the marginal cost of producing q^* is smaller than the marginal cost of sourcing on the spot market. In the high season, it is instead profitable to sell quantity in excess of q^* on the spot market. The assumption also implies that the total surplus generated by the relationship is higher in the high season than in the low season.

Second Best Relational Contract and Seller Incentive Compatibility

When contracts cannot be written and enforced, parties resume to a relational contract to manage the procurement of flowers. In general, a (stationary) relational contract specifies quantities and payments between the parties in the high and low season. We are interested in determining the conditions under which the first best contract can be implemented, so that a constant level of trade $q_s = q^*$ can be sustained between the parties throughout the relationship. The relational contract is therefore described by unit prices $\underline{t}$ and $\overline{t}$ that the buyer pays to the seller upon successful delivery of quantity q^* in the low and high season respectively.

In this environment, both the buyer and the seller might have incentives to renege on the implicit contract. The buyer might be tempted to avoid paying the price tq^* once the flowers have been received. The seller, instead, might prefer to produce and sell to the buyer a quantity different from the agreed one, q^*. Critically, in evaluating the relative merit of adhering or reneging on the contract, the parties take into account what will happen to the relationship following a failure to deliver q^* or to pay the corresponding price. We assume that, shall any of the two parties renege on the implicit contract, the relationship ends and parties revert to the spot market forever.

Given the focus of the empirical analysis, we consider the incentive constraints for the seller. Denote by $U \in \{\underline{U}, \overline{U}\}$ the value of the relational contract for the buyer and by $U^o \in \{\underline{U}^o, \overline{U}^o\}$ the value of sourcing flowers from the spot market forever, which is assumed to be the punishment for renaging on the relational contract. Intuitively, when the prices on the spot market are high, the relational contract must prevent the supplier from selling the flowers on the spot market deriving an associated gain $\left(p - \overline{t}\right) q^*$ and loosing the future rents derived from the relationship, $\delta\left(\overline{U}^o - \overline{U}\right)$. When, instead, prices on the spot market are low, the relational contract must give incentives to the

supplier to produce the specified quantity q^*.

The following Proposition shows that the only relevant constraint for the seller is the one in the high season. The Proposition, therefore, formally establishes the use of the maximum temptation to deviate throughout the season as the correct proxy for the value of the relationship:

Proposition *Assume that, as observed in the data, $p > \bar{t}$. Then, the seller's incentive compatibility constraint in the low season is never binding. The temptation to renage in the high season, given by $q^*(p - \bar{t})$, therefore provides a correct lower bound to the value of the relationship for the seller.*

Proof:

We first establish that the relevant set of incentive constraints for the seller is given by:

$$\begin{aligned} \overline{IC}^S &: \bar{t}q^* + \delta\underline{U} \geq pq^* + \delta\underline{U}^o, \\ \underline{IC}^S &: \underline{t}q^* - C(q^*) + \delta\overline{U} \geq \delta\overline{U}^o \end{aligned} \tag{6}$$

Intuitively, the seller might decide to change production plans when prices at the spot market are low, or she might decide to change sales plans when the prices on the spot market are high. Therefore, both sets of constraints need to be derived. The set of constraints associated with changing production plans, IC_P, is derived as follows. Taking into account the fact that $q_{A^*} = 0$ in the low season, the set of incentive constraints in the high and low season respectively is given by:

$$\begin{aligned} \overline{IC}_P &: \bar{t}q^* + pq_A - C(q^* + q_A) + \delta\underline{U} \geq pq_{A^*} - C(q_{A^*}) + \delta\underline{U}^o, \\ \underline{IC}_P &: \underline{t}q^* - C(q^*) + \delta\overline{U} \geq \delta\overline{U}^o. \end{aligned}$$

The best possible deviation satisfies $C'(q_{A^*}) = p$. Since $q_A > 0$, however, the same holds true for $q^* + q_A$, hence $q_{A^*} = q^* + q_A$. Therefore, this set of incentive constraints can be rewritten as

$$\begin{aligned} \delta\left(\underline{U} - \underline{U}^o\right) &\geq \left(p - \bar{t}\right)q^*, \\ \underline{t}q^* - C(q^*) + \delta\overline{U} &\geq \delta\overline{U}^o. \end{aligned}$$

Second, once the seller has produced the agreed quantity of flowers $q^* + q_A$, she must prefer to sell those flowers according to the specified relational contract (rather than

selling a larger part of the produce on the spot market). The corresponding set of incentive constraints is given by:

$$\begin{aligned} \overline{IC}_2^S &: \bar{t}q^* + pq_A + \delta\underline{U} \geq p(q^* + q_A) + \delta\underline{U}^o, \\ \underline{IC}_2^S &: \underline{t}q^* + \delta\overline{U} \geq \delta\overline{U}^o. \end{aligned}$$

It is obvious that the relevant set of incentive constraint is as stated in (6).

To derive the corresponding value functions, denote by $\overline{\Pi}(q^*) = \left(\bar{t} - p\right) q^* + \frac{p^2}{2c}$ and $\underline{\Pi}(q^*) = \underline{t}q^* - c(q^*)$ the per period profits from the relationships in the high and low season. The value of the relationship in the high and low seasons are respectively given by:

$$\overline{U} = \frac{\overline{\Pi}(q^*) + \delta\underline{\Pi}(q^*)}{1-\delta^2} \text{ and } \underline{U} = \frac{\underline{\Pi}(q^*) + \delta\overline{\Pi}(q^*)}{1-\delta^2}. \tag{7}$$

Assuming that upon the breakdown of the relationship the supplier sells forever on the spot market, the value of the outside option in the high and low season respectively is given by:

$$\overline{U}^o = \frac{1}{1-\delta^2}\frac{p^2}{2c} \text{ and } \underline{U}^o = \frac{\delta}{1-\delta^2}\frac{p^2}{2c}. \tag{8}$$

The incentive compatibility can be derived, after some manipulation, by substituting (7) and (8) in 6. This gives

$$\overline{IC}^S : \delta\left(\underline{t}q^* - C(q^*)\right) \geq \left(p - \bar{t}\right) q^*, \tag{9}$$

$$\underline{IC}^S : \frac{\left(\underline{t}q^* - C(q^*)\right)}{\delta} \geq \left(p - \bar{t}\right) q^*.$$

Since $\delta < 1$, the constraint in the high season, $\overline{IC}^S$, implies the constraint in the low season, $\underline{IC}^S$, and therefore the only constraint that could be binding is the one in the high season. Note that this assumes that $p > \bar{t}$, which will be proven to hold below.■

10 Appendix B

This appendix provides information supplementary to Section 2 on the various data sources used in this paper.

Firm Transactional level Export Data

We analyze data on exports of flowers from Kenya. The data cover all exports of flowers during the period from April 2004 to August 2009. These data are collected by Horticultural Crops Development Authority (HCDA), a parastatal body established

under the Agricultural Act, Cap 318, which develops, promotes, coordinates and regulates the horticultural industry in Kenya. Records of each export transaction are entered in close collaboration with customs services as well as KEPHIS, the agency responsible for phytosanitary inspection of export produce, which are compulsory and strictly enforced. The invoice for each transaction is directly entered into the database at HCDA before the flowers are exported out of the country. Each transaction invoice contains the following information: the name of the Kenyan exporter, the foreign consignee/client, the type of produce, the weight (kgs), the units, the unit value, the total value, the date, the destination, the currency and the agreement on freight (C&F, FOB). Because seasonal patterns are important, we restrict our sample to established exporters that export throughout most of the season in the year preceding the violence. There are approximately 120 producers satisfying those requirements and they cover more than ninety five percent of the exports recorded in the data.

Survey and Administrative Data

The empirical analysis in this paper exclusively relies on the export records. Information provided in the background section, however,was collected through a firm-level survey. The survey was designed in collaboration with Chris Ksoll and was implemented by the authors in July to September 2008. The survey covered i) general questions about the firm (history, farm certification, ownership structure, level of vertical integration, location of farms etc.), ii) contractual relationships in export markets and marketing channels (direct wholesaler and/or auction houses), iii) firm production (covering detailed information on labor force, input use and assets), iv) retrospective post-election violence period (effect on operations, loss of workers by week, issues on transportation and air-freight, financial losses and extra-costs incurred). The survey was administrated to the most senior person at the firm, which on most occasions was the owner himself/herself. Upon previous appointment, face-to-face interviews of one to two hours were conducted by the authors with the respondent.

Further administrative data on firms location, ownership, buyer's activity and auction prices was collected from various sources. HCDA, Kenya Flower Council (KFC) and several field visits during the survey, gave the location of all regular exporters in the sample. The names of the directors of the firms are obtained from the Registrar of Companies at the Attorney General's Office. This provides information on the owner's nationality. Internet search and interviews with people in the industry guided the classification of foreign buyers into different marketing channels. Finally, data on prices and volumes at the auctions is obtained at the weekly level from the International

Trade Centre, UNCTAD/WTO, Geneva.

Days of Violence and Conflict location

To classify whether a location suffered conflict or not we rely on the Kenya Red Cross Society's (KRCS) *Information Bulletin on the Electoral Violence.* The KRCS issued the bulletins in the early stages of the crisis daily and later on they were issued every 3/4 days till the end of the crisis.[25] The first information bulletin (No. 1 of 3^{rd} January 2008) also contained a map which outlined locations where unrest had occurred. We further obtain access to various sources to supplement our understanding on both whether the location suffered conflict and when this took place. These are (i) *Disaster Desk* of the Data Exchange Platform for the Horn of Africa (DEPHA)[26], during the post election violence DEPHA provided maps with hot spots on where and when the violence had occurred,[27] (ii) the open source project known as *Ushahidi,* was launched to gather information from the general public on events occurring in near-real time. The general public could on a map of Kenya pin up a town/area where conflict had erupted and when,[28] (iii) the Kenya National Commission on Human Rights Report (2008) which was initiated by the Human Rights organization itself (iv) Independent Review Commission Report (2008) which was initiated by the Government of Kenya to set up a commission into the post election violence. These sources are useful to make sure we are exhaustive and that smaller towns are not missed out. We use these reports to aid our understanding but are aware that there could be measurement error inherent due to their purpose. As mentioned there were two outbreaks of violence. The first one occurred as soon as the election results were announced on the 29^{th} December 2007 which lasted until the 4^{th} Jan 2008, locations which were suffered from violence then were Eldoret, Kitale and Nakuru. The second outbreak occurred between the 25^{th} January 2007 and 30^{th} January 2008, the town of Naivasha suffered during this outbreak.

[25] See Kenya Red Cross Society (2008) for details.

[26] DEPHA's goal is to provide geographic information data and services to the region under the UN's OCHA.

[27] We obtain all the DEPHA maps from: `http://www.depha.org/Post_election_Violence.asp` (Accessed on 23 September 2008). Similiar information is also available from `http://www.reliefweb.int` which is also under the UN's OCHA.

[28] For details about *Ushahidi* see `http://www.ushahidi.com/about`. For the Kenya project see `http://legacy.ushahidi.com/` (accessed on 30 September 2008).

Table 1: Direct Relationships, Descriptive Statistics

Variable	Observations	Mean	St. Dev.	Min	Max
Number of Shipments	189	60.60	35.69	20.00	140.00
Number of Stems per Week (in 1000s)	189	102.39	165.14	1.53	971.72
Av. FOB Price (Euro Cents per stem)	189	12.11	11.65	1.25	25.75
Age (in Days)	189	860.12	449.45	33.00	1352.00
Number of Previous Transactions	189	298.23	288.80	20.00	1128.00
Left Censored (Yes = 1, No =0)	189	0.44	0.49	0.00	1.00
Estimated Value (Relative to Week)	189	3.31	4.23	0.00	26.90
Estimated Value (Relative to Season)	189	0.10	0.19	0.00	1.78
Highest Volume (Relative to Week)	189	2.45	3.11	1.04	6.51

Source: Authors calculations from HCDA Transaction level data on all flower exports. The sample is given by all relationships active immediately before the violence, i.e., only relationships that had more than 20 transactions from the beginning of the season. Left censored refers to relationships that were already active before the beginning of the period covered in the data, i.e., relationships that were active before September 2004.

Table 2: History and Future Value of Relationships

Dependent Variable: Relationship Value	[1]	[2]	[3]	[4]
Relationship Age (in Days)	0.381**			0.012
	[0.181]			[0.161]
Number of Previous Shipments		0.440***		0.112
		[0.099]		[0.232]
Past Temptations to Deviate (Cumulative)			0.257***	0.223**
			[0.057]	[0.112]
Firm and Buyer Fixed Effects	yes	yes	yes	yes
Number of observations	146	146	146	146

***, **, * denote statistical significance at the 1%, 5% and 10% level respectively. The Table reports correlation between the estimated value of a relationship and different measures of the past history of the relationship. The value is computed for the season before the violence and the sample refers to relationships that were active during the period. The sample excludes relationships that are in the baseline sample but were not active in the season preceding the violence and includes relationships that did not survive until the violence season. A dummy for whether the relationship is left-censored is included as control. Robust standard errors, two-way clustered at the firm and buyer level are reported in parenthesis.

Table 3: The Violence Reduced Exports in Direct Relationships

Dependent Variable: Reliability at Time of Violence	[1]	[2]	[3]	[4]
Conflict Region	-0.414**	-0.392*	-0.302*	-0.151*
	[0.206]	[0.205]	[0.157]	[0.081]
Relationship Controls	no	yes	yes	yes
Exporter Controls	no	no	yes	yes
Buyer Controls	no	no	no	yes
Number of observations	189	189	189	189

***, **, * denote statistical significance at the 1%, 5% and 10% level respectively. The Table reports the difference in mean in estimated reliability between direct relationships of firms located in regions directly affected by the violence against direct relationships of firms located in regions not directly affected. Reliability is computed as the ratio of realized exports over predicted exports during the second spike of the violence. The predicted values are obtained by fitting a relationships specific regression of shipments in any given day of the week with shipments in the corresponding day for the previous week, taking into account seasonality patterns. For the median relationship in the sample, this regression has an R-square equal to 0.85. Robust standard errors, two-way clustered at the firm and buyer level, are reported in parenthesis.

Table 4: Relationship Value and Reliability

	Conflict Region				No Conflict Region	
Dependent Variable: Reliability at Time of Violence	[1]	[2]	[3]	[4]	[5]	[6]
Relationship Value	0.066***	0.077*			-0.011	
	[0.023]	[0.048]			[0.040]	
Maximum Sustainable Quantity			0.182**	0.128*		-0.089
			[0.085]	[0.070]		[0.170]
Firms Fixed Effects	yes	yes	yes	yes	yes	yes
Relationship Controls	yes	yes	yes	yes	yes	yes
Buyer Fixed Effects	no	yes	no	yes	no	no
Number of observations	94	94	95	94	94	95

***, **, * denote statistical significance at the 1%, 5% and 10% level respectively. The Table reports within firms correlations between estimates of the value of the relationships before the violence and reliability at the time of the violence. Reliability is computed as the ratio of realized exports over predicted exports during the second spike of the violence. The predicted values are obtained by fitting a relationships specific regression of shipments in any given day of the week with shipments in the corresponding day for the previous week, taking into account seasonality patterns. For the median relationship in the sample, this regression has an R-square equal to 0.85. Relationship controls include buyer location and size, relationship age, estimated value and export volumes before the violence. Robust standard errors, two-way clustered at the firm and buyer level, are reported in parenthesis.

Table 5: Conflict and No-Conflict Regions

Dependent Variable: Relationship Death (Season Following the Violence)	[1]	[2]	[3]	[4]
Conflict Region	0.057	0.041	0.213*	0.168*
	[0.051]	[0.061]	[0.117]	[0.094]
Reliability at Time of Violence			0.007	-0.007
			[0.032]	[0.032]
Conflict Region X Reliability at Time of Violence			-0.130*	-0.113*
			[0.069]	[0.059]
Relationship Controls	yes	yes	yes	yes
Firm Controls	no	yes	no	yes
Buyer Fixed Effects	no	yes	no	yes
Number of observations	189	189	189	189

***, **, * denote statistical significance at the 1%, 5% and 10% level respectively. The Table shows that the violence has destroyed relationships for which reliability at the time of the violence was sufficiently low. No relationship exists between reliability and relationship survival in regions not affected by the violence. The sample is given by all relationships active immediately before the violence. Reliability is computed as the ratio of realized exports over predicted exports during the second spike of the violence. The predicted values are obtained by fitting a relationships specific regression of shipments in any given day of the week with shipments in the corresponding day for the previous week, taking into account seasonality patterns. For the median relationship in the sample, this regression has an R-square equal to 0.85. Relationship controls include buyer location and size, relationship age, estimated value and export volumes before the violence. Firm controls include size, number of relationships, and share of exports to direct relationships. Bootstrapped standard errors are reported in parenthesis.

Figure 6: Reliability and Future Relationship Outcomes

Dependent Variableand Sample (Beginning of Season Following Violence):	**Average Weekly Volumes**			**Average FOB Prices**		
	Conflict Region		No-Conflict Region	Conflict Region		No-Conflict Region
	[1]	[2]	[3]	[4]	[5]	[6]
Reliability	0.356**	0.307*	0.046	0.149**	0.148**	0.018
	[0.170]	[0.168]	[0.100]	[0.069]	[0.070]	[0.042]
Past Estimated Value		0.081			0.011	
		[0.056]			[0.026]	
Relationship Controls	yes	yes	yes	yes	yes	yes
Firm Fixed Effects	yes	yes	yes	yes	yes	yes
Buyer Fixed Effects	yes	yes	yes	yes	yes	yes
Number of observations	78	78	87	78	78	87

***, **, * denote statistical significance at the 1%, 5% and 10% level respectively. The Table shows that reliability at the time of the violence correlates with volumes and unit prices of exports at the beginning of the season following the violence in the region directly affected by the violence but not in regions not directly affected. The sample is given by the set of surviving relationships. Reliability is computed as the ratio of realized exports over predicted exports during the second spike of the violence. The predicted values are obtained by fitting a relationships specific regression of shipments in any given day of the week with shipments in the corresponding day for the previous week, taking into account seasonality patterns. For the median relationship in the sample, this regression has an R-square equal to 0.85. Past estimated value corresponds to estimated values before the violence. Regressions controls include buyer location and size, relationship age, estimated value as well as the corresponding dependent variable before the violence. Bootstrapped standard errors are reported in parenthesis.

Table 7: Reliability and Future Values

Dependent Variable and Sample (Season Following Violence):	**Estimated Value**	**Max. Temptation to Deviate**	**Estimated Value**	**Max. Temptation to Deviate**
	Conflict Region		No Conflict Region	
	[1]	[2]	[3]	[4]
Reliability at Time of Violence	0.672***	0.847**	0.084	0.022
	[0.277]	[0.391]	[0.196]	[0.187]
Relationship Controls	yes	yes	yes	yes
Firm Fixed Effects	yes	yes	yes	yes
Number of observations	78	78	87	87

***, **, * denote statistical significance at the 1%, 5% and 10% level respectively. The Table shows that reliability at the time of the violence correlates with estimates of the value of the relationship in the season following the violence in the region directly affected by the violence but not in regions not directly affected. Reliability is computed as the ratio of realized exports over predicted exports during the second spike of the violence. The predicted values are obtained by fitting a relationships specific regression of shipments in any given day of the week with shipments in the corresponding day for the previous week, taking into account seasonality patterns. For the median relationship in the sample, this regression has an R-square equal to 0.85. Regressions controls include buyer location and size, relationship age, estimated value and shipments before the violence. Bootstrapped standard errors are reported in parenthesis.

Table 8: Reliability: Direct Relationships vs. Auctions

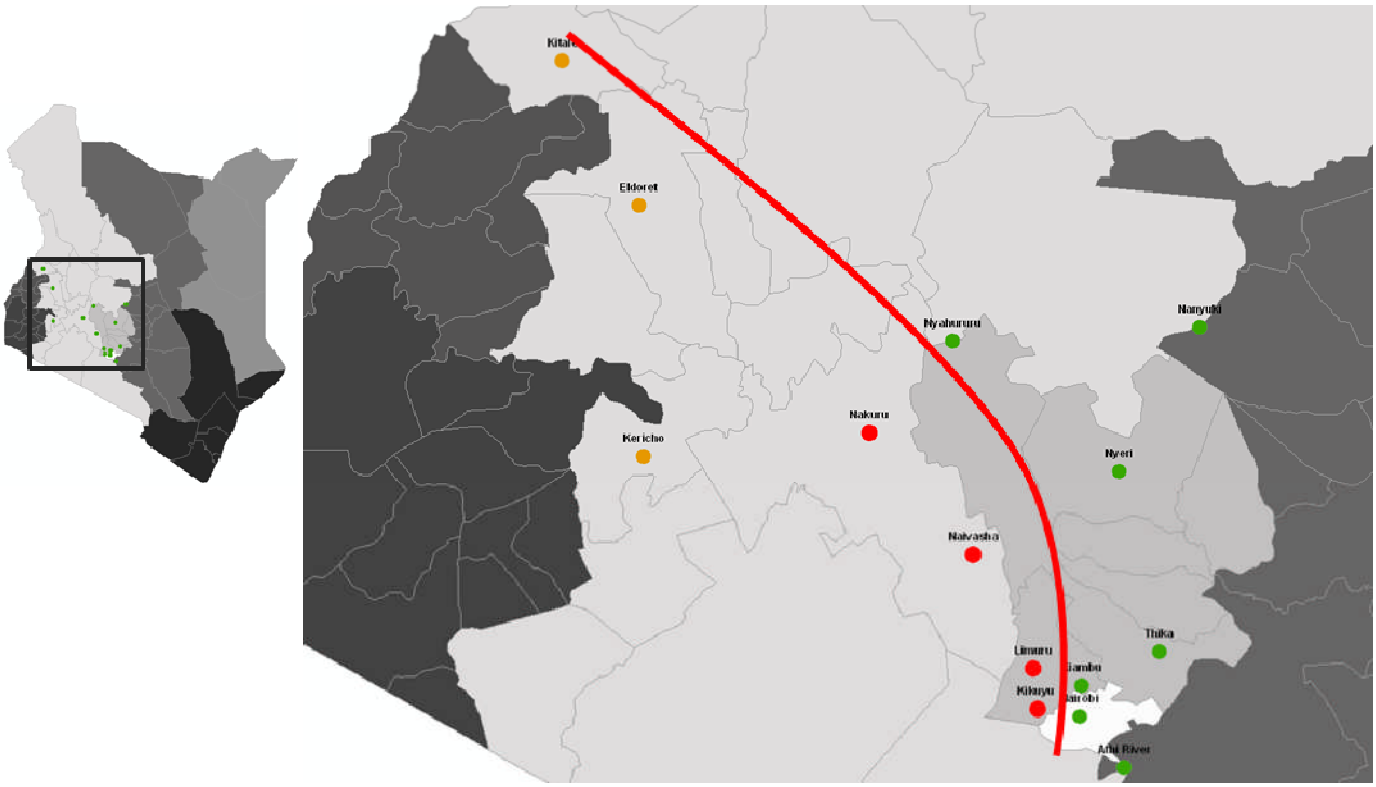
Dependent Variable: Reliability at Time of Violence	[1]	[2]
Conflict Region	-0.865*** [0.082]	-0.175* [0.096]
Direct Relationship	-0.088 [0.103]	
Direct Relationship X Conflict Region	0.650** [0.312]	
Only Direct Relationships [yes = 1]		0.008 [0.113]
Only Direct Relationships [yes = 1] X Conflict Region		-0.473** [0.239]
Relationship Controls	no	yes
Direct Relationships Only	no	yes
Number of observations	274	189

***, **, * denote statistical significance at the 1%, 5% and 10% level respectively. The Table reports the difference in mean in estimated reliability between direct relationships and auctions for firms located in regions directly affected by the violence and firms located in regions not directly affected by the violence respectively. Only direct relationship takes value equal to one if the firm exports more than ninety percent of its produce to direct relationships. Robust standard errors, two-way clustered at the firm and buyer level, are reported in parenthesis.

Table A1: The Violence, Self-Reported Records

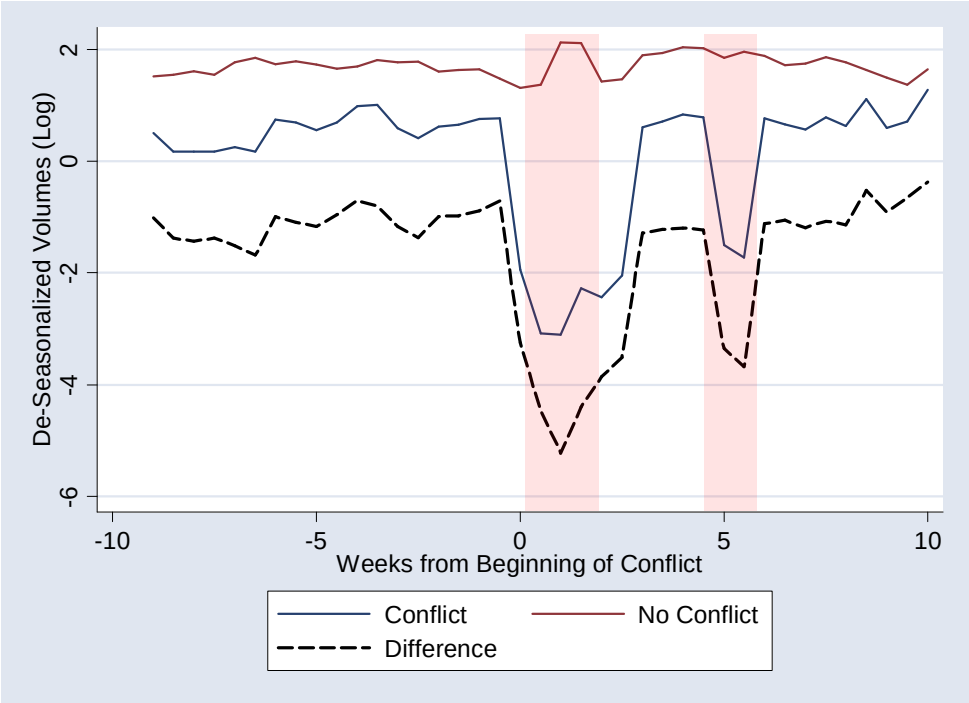
	[1]	[2]	[3]	[4]	[5]	[6]
Dependent Variable:	Did Violence Affect at all the Operations of Your Firm?	Were there any days in which members of your staff did not come to work because of the Violence?	What was the highest proportion of Workers Absent due to the Violence?	To What Extent did Worker Absence Cause a Loss in Production?	Did you Experience Any Transportation Problem to Ship Flowers to the Airport?	Did you Hire Extra Secuirty?
Conflict Region (yes=1)	0.575*** [0.103]	0.702*** [0.072]	43.898*** [5.609]	2.333*** [0.124]	0.477*** [0.100]	0.311*** [0.099]
Dep. Var. in No-Conflict Region (Mean)	0.333	0.206	1.511	0.167	0.233	0.071
Adjusted R-squared	0.36	0.51	0.35	0.55	0.136	0.116
Number of Firms	74	74	74	74	74	74

Figure 1: Conflict and No-Conflict Regions



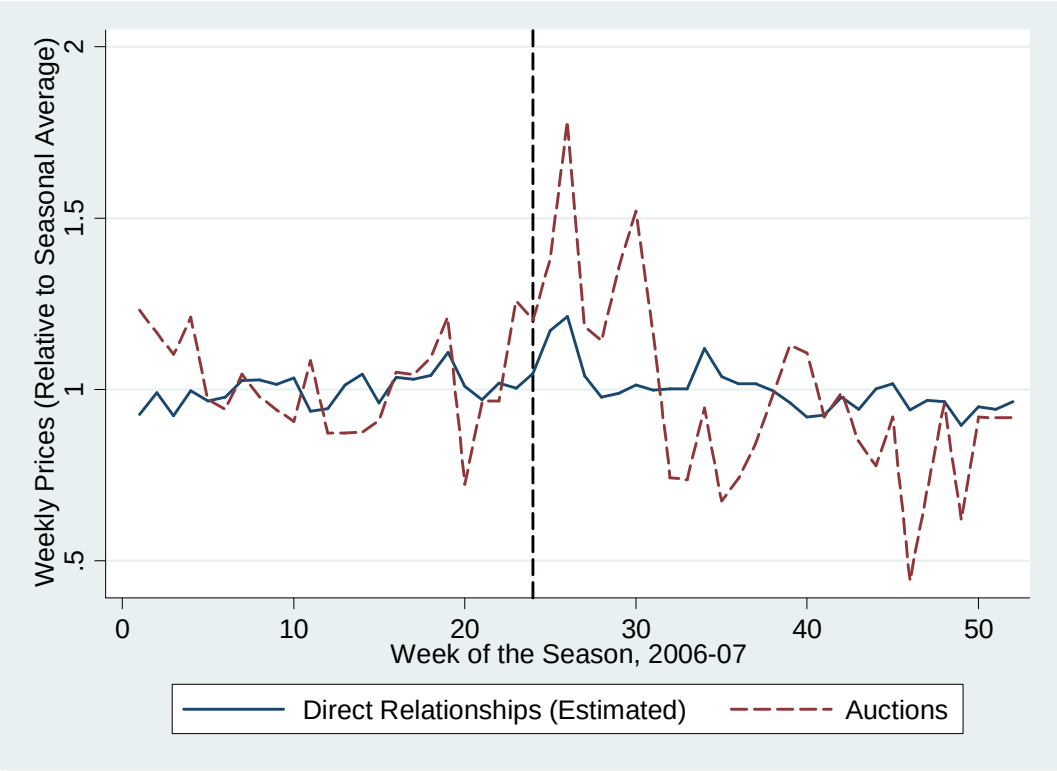
Among the towns around which flower firms are located, the Figure illustrates those locations that were directly affected by the violence to the left of the red line and those locations that were not affected by the violence to the right.

Figure 2: Effect of Violence on Export Volumes



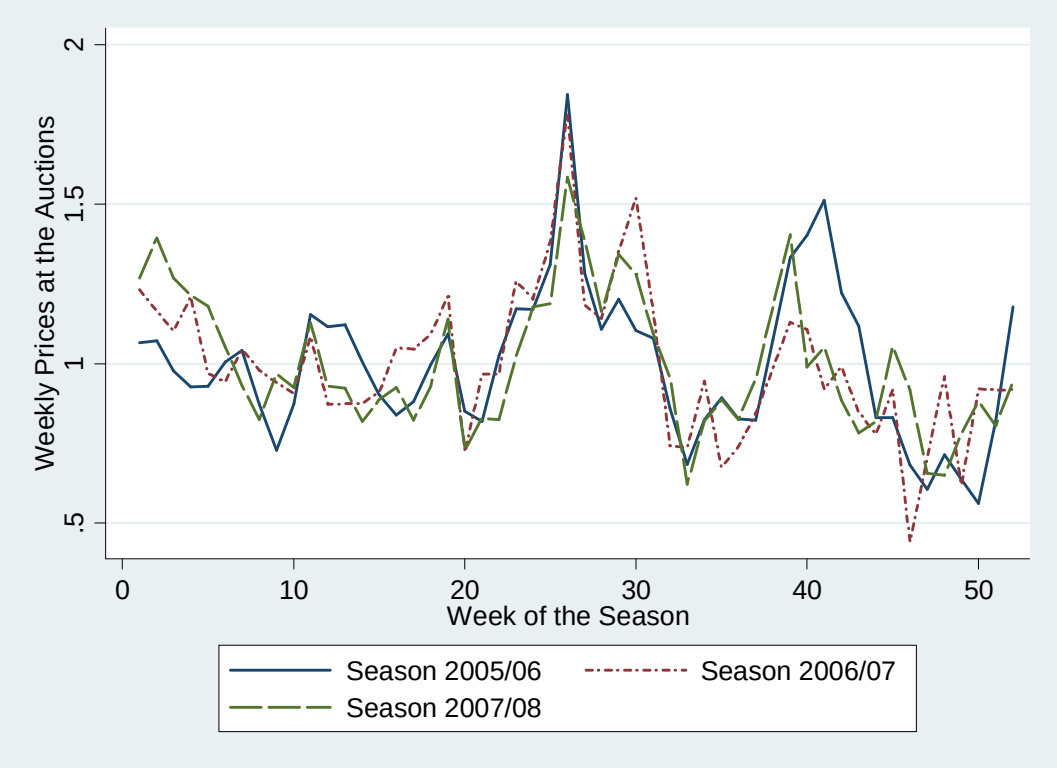
The figure shows the median biweekly residual of a regression that controls for firm specific seasonality and growth patterns in *conflict* and in *non-conflict* locations for the 10 weeks before and 10 weeks after the first outbreak of violence.

Figure 3: Fluctuations in Prices, Direct Relationships vs. Auction



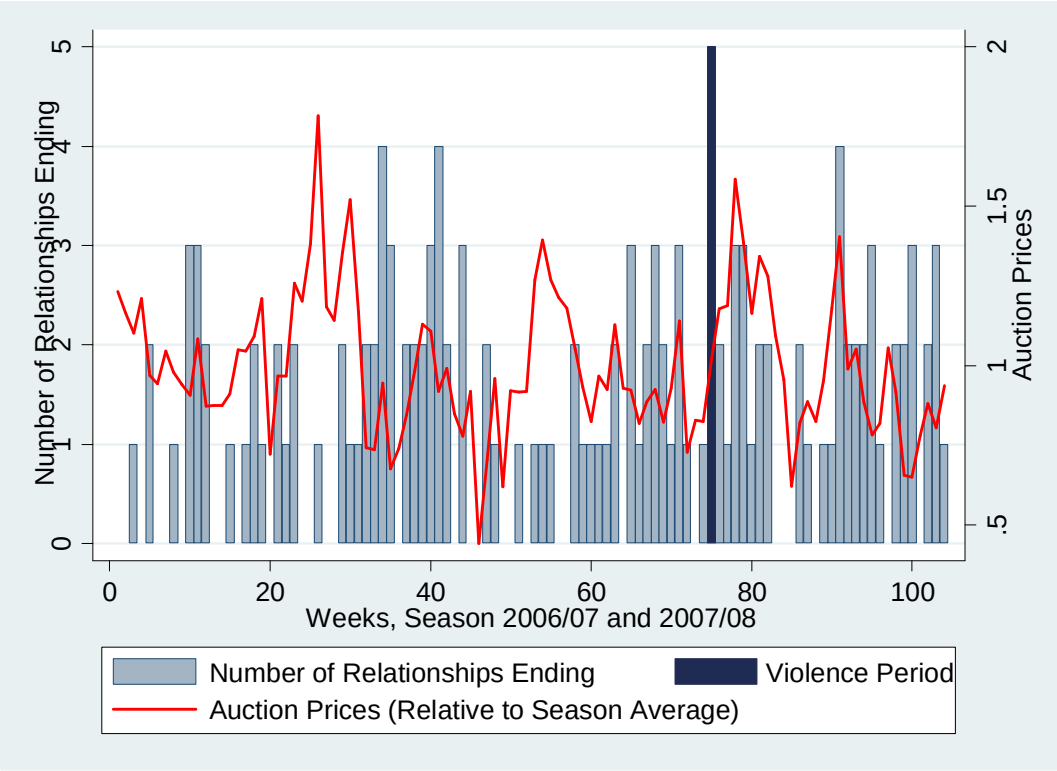
The Figure shows that FOB Prices in Direct Relationships are more stable than prices at the auctions throughout the season. The Figure shows the weekly variation relative to the season mean of FOB prices in direct relationships and at the Auctions. The FOB prices in direct relationships are obtained as week dummies in a regression of FOB prices on relationship fixed effects on the corresponding season. A season begins in mid august.

Figure 4: Seasonal Fluctuations in Auction Prices are Predictable



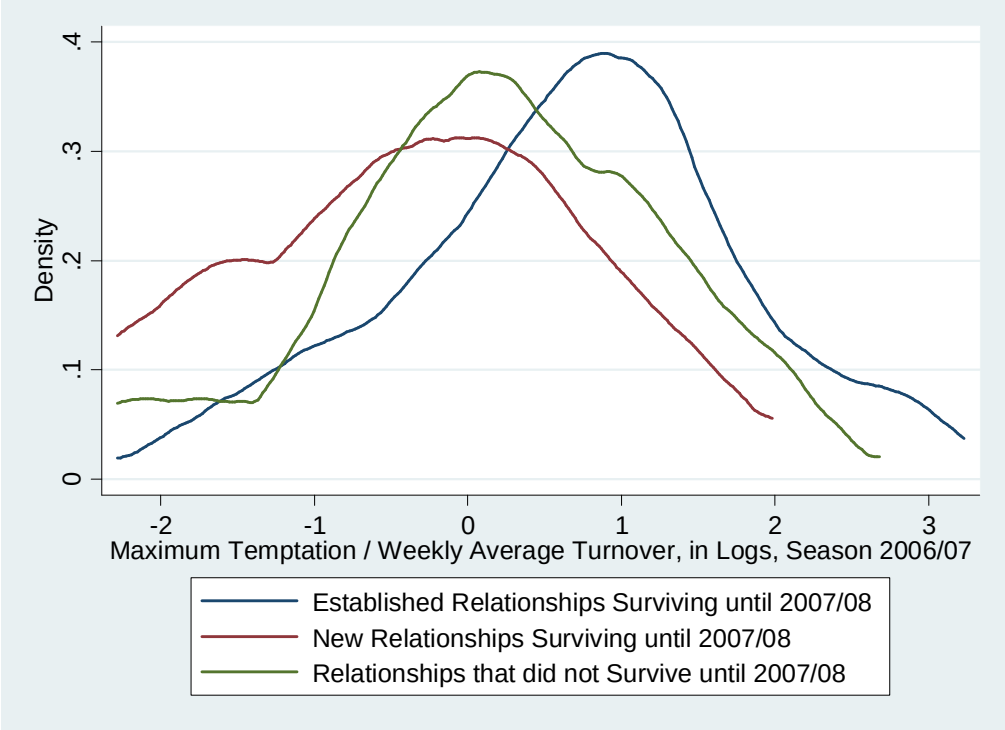
The Figure shows that FOB Prices at the Auctions are highly predictable. A regression of the weekly price at the auction on week and season dummies explains 76% of the variation in prices in the three season preceding the violence period. A season begins in mid august.

Figure 5: Separations Do Not Occur when Auction Prices are High



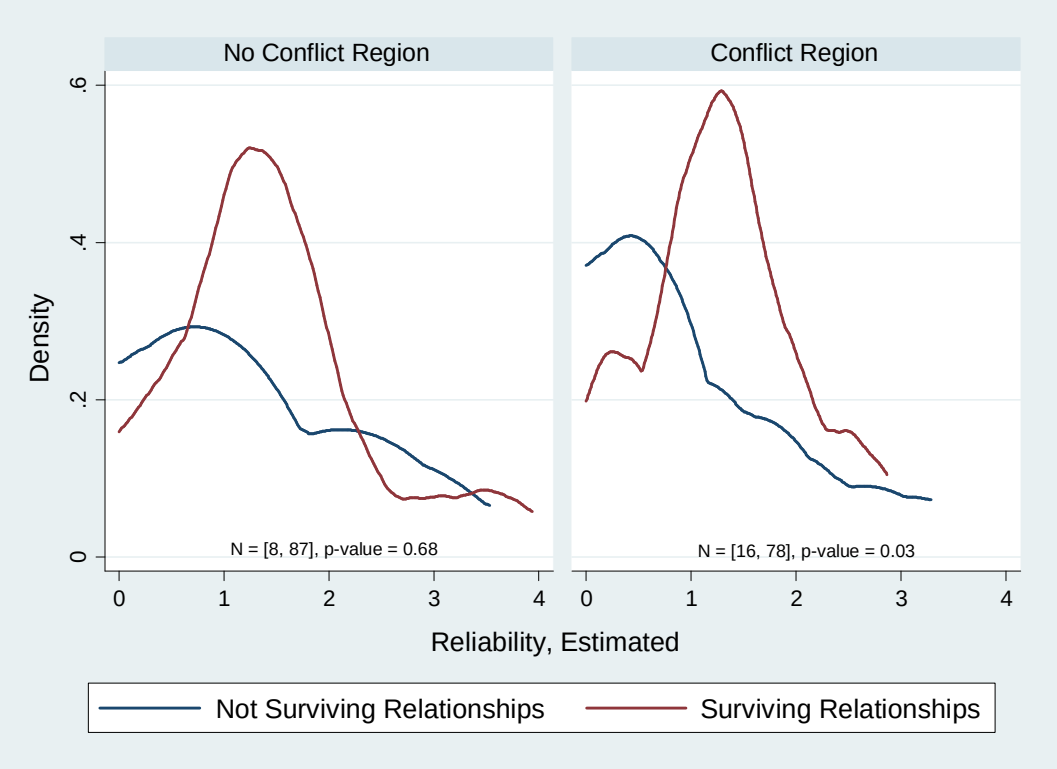
The Figure shows that the number of relationships dying in a given week does not correlate with the price at the Auctions in that week during the two season preceding the violence period. This is consistent with the fact that prices at the auctions are highly predictable. In a regression of the number of relationships dying in a given week that controls for week and season dummies, the coefficient on the violence period is positive and significant. The R-square for the same regression is 0.57. Regardless of whether week dummies are controlled for or not, the level of prices at the auctions do not predict the number of relationships dying.

Figure 6: Surviving Relationships Afford Higher Temptations



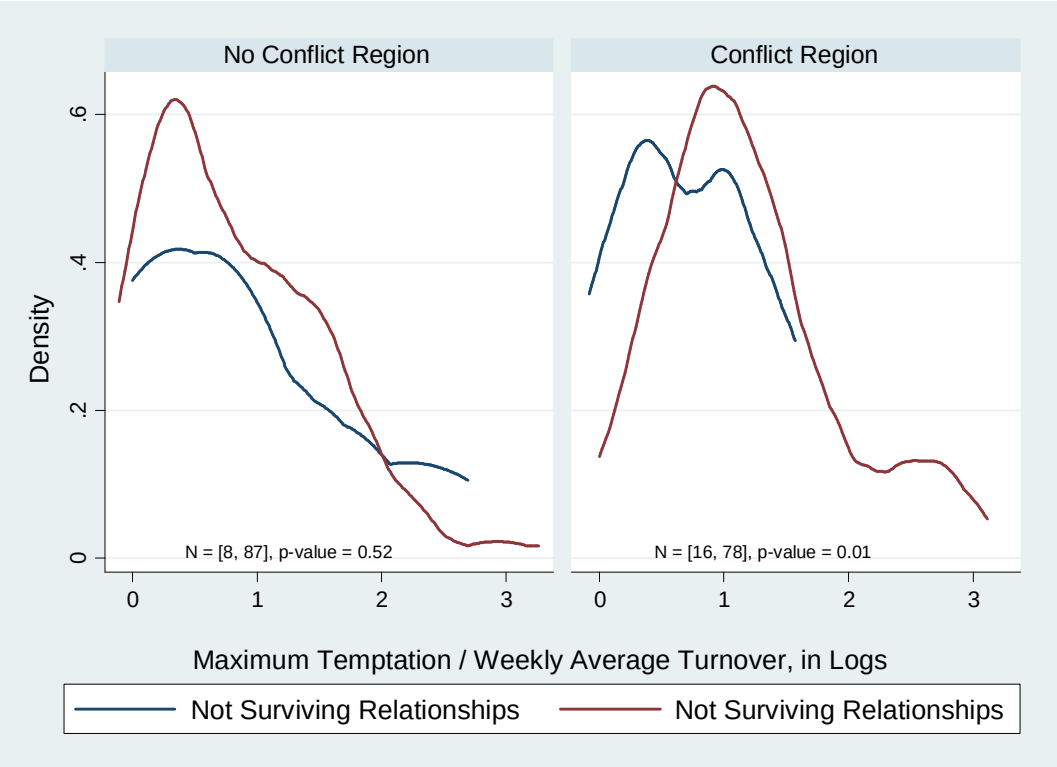
The Figure shows the distribution of the (log of the) value of relationships in the season 2006/07. The value is given by the ratio of the maximum temptation to deviate in any given week of the season, divided by the average weekly value of transactions in the relationship during the season. The maximum temptation to deviate is given by the maximum revenues foregone by the exporter for not selling on the auctions at higher prices during any particular week. Among the relationships in our baseline sample, i.e., those active immediately before the violence period, relationships that were already active before 2006/07 are in blue, new relationships are in red, and relationships that were active in 2006/07 but did not survive are in green. The Figure shows that most valuable relationships, i.e., those that are robust to the higher temptations, are more likely to survive. The equality of mean (and distribution) between surviving and dying relationships is rejected with 1% confidence interval.

Figure 7: Reliability and Survival, Conflict vs. No-Conflict Region



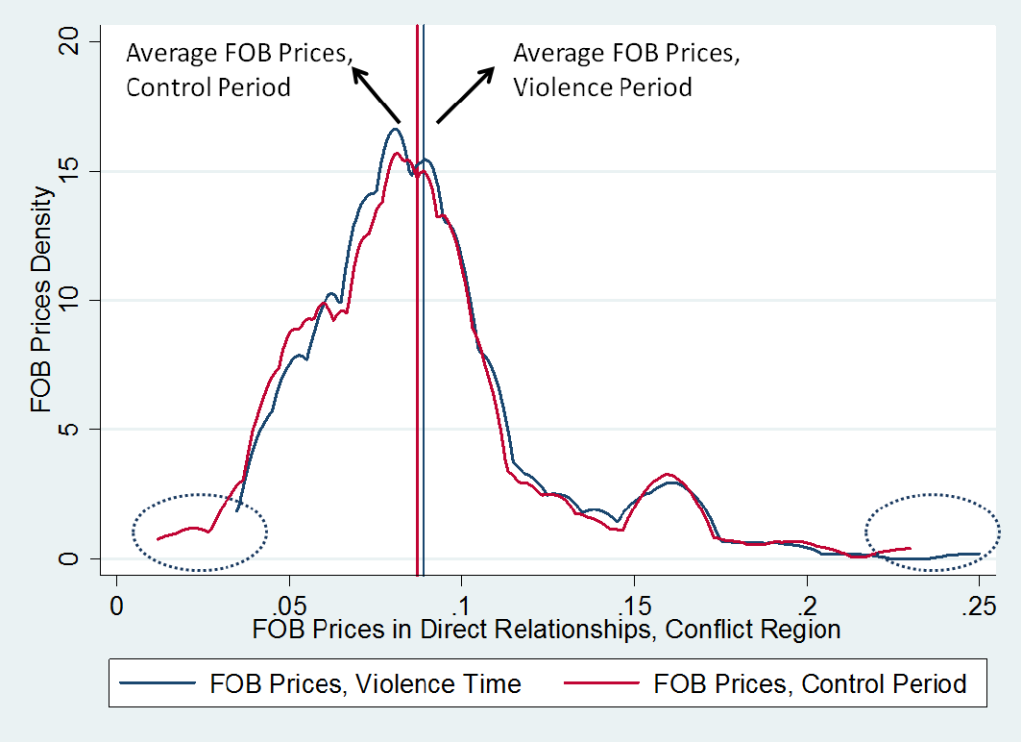
The Figure shows the distribution of the estimated reliability at the time of the violence in the two regions depending on whether the relationship survived until the following season. The Figure shows that the estimated reliability is higher for relationships that survived relative to relationships that did not survive in the conflict region (p-value = 0.03) but not in the no-conflict region (p-value = 0.68).

Figure 8: The Value of Destroyed Relationships: Conflict vs. No-Conflict



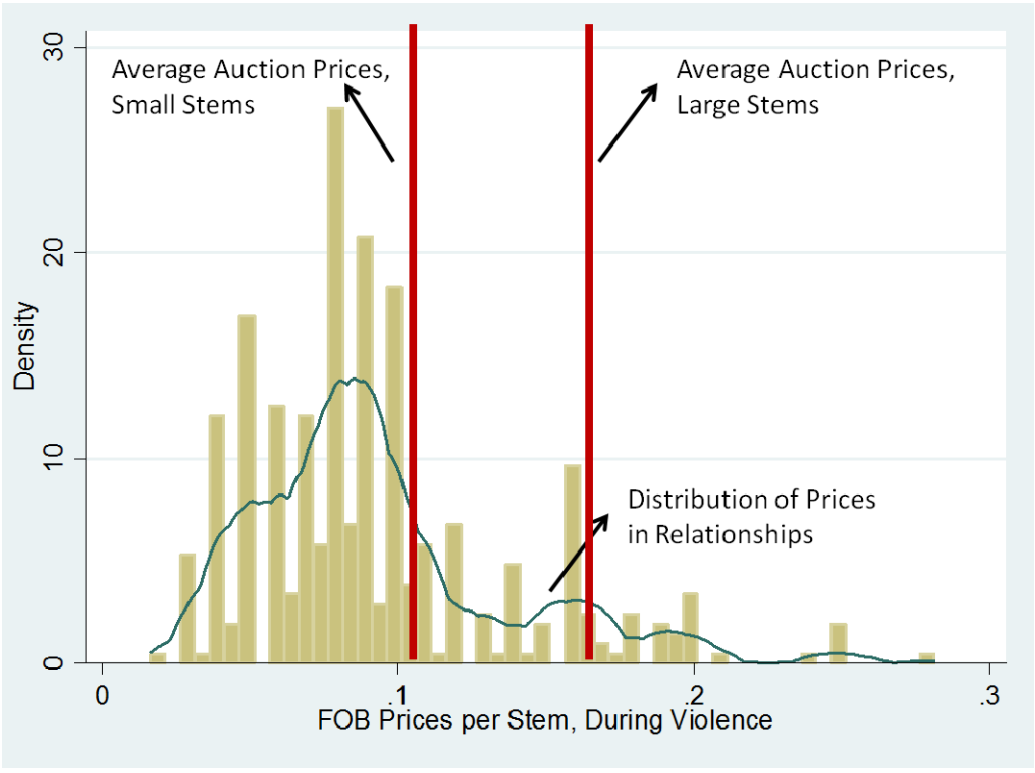
The Figure shows the distribution of the (log of the) value of relationships in the season 2006/07 for relationships in the conflict and no-conflict regions depending on whether the relationship survived until the following season. The value is given by the ratio of the maximum temptation to deviate in any given week of the season, divided by the average weekly value of transactions in the relationship during the season. The maximum temptation to deviate is given by the maximum revenues foregone by the exporter for not selling on the auctions at higher prices during any particular week. The Figure shows that in the conflict region the violence destroyed relationships that were the least valuable (p-value = 0.001).

Figure 9: No Renegotiation of FOB Prices at the Time of the Violence



The Figure shows the distribution of average FOB prices per stem in direct relationships at the time of the violence and in the control period, i.e., the ten weeks prior to the violence. The two vertical lines show average FOB prices at the time of the violence and in the control period. The figure shows that prices were not renegotiated upward at the time of the violence. (Source: authors calculations from HCDA Data).

Figure 10: FOB Prices at the Time of the Violence: Auctions vs. Direct Relationships



The Figure shows the distribution of average FOB prices per stem in direct relationships at the time of the violence. The two vertical lines show the average prices of small and large stems of roses at the Dutch auctions at the time of the violence. The figure shows that most relationships paid prices lower than at the spot market. (Source: authors calculations from HCDA Data and Auctions Data).

Figure A1: Temporal Structure of the Study