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

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Abstract

Contract enforcement between firms is an essential ingredient of economic development. Empirically, however, little is known about how enforcement is achieved in the absence of formal contracts and whether the associated inefficiencies are quantitatively relevant. This paper exploits transaction level data to provide a quantitative estimate of the value of relational contracts in the context of Kenya flowers exports, a setting in which formal contracts are not available and relational contracts coexist alongside a spot market. A lower bound estimate for the value of the relationship is derived from the incentive compatibility constraint of a stylized relational contract model. The value of the relational contract is at least 7% of the yearly turnover for the average relationship in the sample. Exploiting an exogenous shock to the cost function induced by an episode of ethnic violence, we find strong support for other assumptions and predictions of the model.

Keywords: Relational Contracts, Spot Market, Export Oriented Industry, Ethnic Violence.

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

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1 Introduction

The ability to enter binding agreements is recognized as an essential ingredient for economic development (see, e.g., Greif (2005)). When formal enforcement is either not available or too costly to access, parties engaging in economic transactions rely on informal mechanisms to assure the obligations and goodwill required by their exchange. From a theoretical point of view, therefore, the idea that reputation and relational contracts can enhance trade is well appreciated (see, e.g., Fama (1980), Klein and Laffer (1981), Shapiro (1982), MacLeod and Malcomson (1989) and Kranton (1996)). Empirically, however, it has proven difficult to show how informal enforcement is achieved in practice and to quantitatively assess the importance of the contractual frictions that render informal enforcement necessary.

This paper exploits detailed transaction level data of Kenya flowers exporters to provide a quantitative estimate of the value of relational contracts in export markets. Our strategy combines a simple theoretical framework with two unique features of our data. First, we present a stylized model of a relationship between a buyer and a seller of flowers in which contracts are impossible to write and enforce and flowers can be sold and bought on a spot market (at some further intermediation costs). From the incentive compatibility constraints necessary to sustain the relationship we derive an empirically observable proxy for the unobservable surplus available in the relationship as well as a lower bound to the value of the relational contract for the seller. Crucially, the derived proxy and the lower bound only rely on information on quantities and unit prices which is available in customs data, and do not require knowledge of the firm production costs, which is typically unobserved. The model also delivers further testable predictions on the response of transaction volumes to a negative supply shock. The shock is introduced to empirically solve for selection into contractual arrangements, as described below.

The empirical strategy relies on the coexistence of different contractual forms in the industry as well as on an exogenous negative shock to the short-run cost function of some firms in the industry. 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.[1] Alongside the Dutch auctions, flowers are also

[1] The "Dutch auction", also known as "clock auction", is named after the flower auctions in the Netherlands. In a "Dutch Auction" the auctioneer begins with a high asking price which is lowered until some participant is willing to accept the auctioneer's price. The winning participant pays the last announced price. This type of auction is convenient when it is important to auction goods quickly, since a sale never requires more than one bid.

sold to specialized wholesalers and importers that directly source from producers in Kenya. A survey we conducted among producers in Kenya reveals that these relationships are typically not governed by a written contract. 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 rely on repeated transactions and reputation to assure good contractual performance. The coexistence of the two marketing channels allows us to use spot market prices to estimate the value of the relationship, as suggested by the model.

We provide further evidence consistent with the presence of rents by testing other predictions derived from the model. In particular, we exploit an exogenous shock that made it difficult for half of the firm in the industry to supply flowers. Following contested presidential elections, several parts of Kenya plunged in intense episodes of ethnic violence. The main consequence of the violence was that, in an industry in which workers are trained to perform highly specialized tasks required to assure timely delivery of product quality, suddenly several firms found themselves lacking significant proportions of their trained labor force.[2] The exogenous shock allows to control for selection into different contractual forms, a major challenge in the empirical literature on contractual forms.

In response to the negative supply shock, exports through direct relationships with foreign buyers suffer a significantly smaller reduction than exports to the Dutch auctions. Since prices at the auctions were higher than prices within direct relationships and firms have substituted flowers sales away from the auctions and towards direct buyers, the evidence implies that exporters derive future rents from maintaining good relationships with foreign buyers. Moreover, those rents are economically sizable. Using the lower bound implied by the model, we find that the value of the relational contract is at least worth 10% of the yearly turnover for the average relationship.

Furthermore, the evidence suggests that export volumes drop *relatively more* in relationships with higher available surplus. In particular, export volumes more in relationships with more stable prices throughout the year as well as in relationships with more frequent shipments (two theoretically grounded proxy for the surplus available

[2] In Ksoll et al. (2009) we discuss in greater detail the background to the violence and its effects on the industry.

to the contracting parties).[3]

McMillan and Woodruff (1999), Banerjee and Duflo (2000), and Macchiavello (2007) are closely related contributions. 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. Exploiting exchange rate shocks, Macchiavello (2007) shows that exporters entering a new market capture an increasing fraction of the surplus generated by their relationship with foreign distributors as their reputation improves.[4]

The rest of the paper is organized as follows. Section 2 provides a simple theoretical framework to guide the empirical exercise. Section 3 presents the data as well as descriptive evidence on the relationships. Section 4 provides the main empirical results. Section 5 discusses policy implications and offers some concluding remarks. An Appendix derives the theoretical results and provides further details on the data.

2 Theoretical Framework [Preliminary !]

This Section introduces a stylized theoretical framework to i) derive predictions on how the volumes of flowers transacted is affected by a negative supply shock, and ii) guide the use of observable prices and volumes to derive an empirical proxy for the surplus available in the relationship as well as 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

[3] We also find evidence that firms that sell most of their flowers through direct relationships exerted effort to retain their workers, further suggesting the value of maintaining good relationships.

[4] 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 attenautes hold-up problems. Rauch (1999) compares networks of relationships and decentralized markets in international trade while Kranton and Swamy (2007) emphasize contractual frictions in export markets in a rather different setting. Egan and Mody (1992) and Gereffi (1999)) emphasize the value of collaborative relationships with foreign buyers.

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 $c(q) = \frac{cq^2}{2}$.[5] 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 $\underline{p} = 0 < \tau < \overline{p} = p < v$.

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 $q^* < \frac{\tau}{c}$.

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,

[5] 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 labour force L.

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.

Assumption 1 guarantees that the model captures well established practices in the industry.[6] The optimal sourcing policy 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 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.

[6] 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).

First, we consider the incentive constraints for the buyer. In each season it must be that the buyer prefers to pay the agreed transfer upon delivery of q^*.[7] Denoting by $V \in \{\underline{V}, \overline{V}\}$ the value of the relational contract for the buyer and by $V^o \in \{\underline{V}^o, \overline{V}^o\}$ the value of sourcing flowers from the spot market forever, the corresponding incentive compatibility constraints in the low and high seasons are given by

$$\begin{aligned} \underline{IC}^B &: vq^* - \underline{t}q^* + \delta\overline{V} \geq vq^* + \delta\overline{V}^o, \\ \overline{IC}^B &: vq^* - \overline{t}q^* + \delta\underline{V} \geq vq^* + \delta\underline{V}^o. \end{aligned} \tag{1}$$

In the Appendix we show that it is possible to rewrite the incentive compatibility constraints for the buyer for the low and high season respectively as

$$\underline{IC}^B : \delta\left((p + \tau + \delta\tau)\right) \geq \underline{t} + \delta\overline{t}, \tag{2}$$

$$\overline{IC}^B : \delta\left(\tau + \delta\left(p + \tau\right)\right) \geq \overline{t} + \delta\underline{t}. \tag{3}$$

The intuition behind the two incentive compatibility constraints for the buyer is straightforward. In order for the buyer to be willing to pay a unit price t in a given season, it must be that this amount is smaller than the discounted future unit prices. Obviously, the constraint is harder to meet in the *high* season: should the buyer renege on the payment in the high season, future procurement on the spot market is cheaper since prices will be low the following period.

We now turn to the seller's incentive constraints. In each season, the relational contract must satisfy two incentive compatibility constraints for the seller. First, the seller must find it profitable to produce the quantity q^*, instead of producing an alternative quantity q_{A^*} and sell it on the spot market. 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). Adapting in an obvious way the notation we used for the buyer, we show in the Appendix that the relevant set of incentive constraints for the seller is given by:

$$\begin{aligned} \overline{IC}^S &: \overline{t}q^* + \delta\underline{U} \geq pq^* + \delta\underline{U}^o, \\ \underline{IC}^S &: \underline{t}q^* - C(q^*) + \delta\overline{U} \geq \delta\overline{U}^o \end{aligned} \tag{4}$$

[7] In principle, the buyer could also refuse the flowers in the first place and source on the auctions. Since the contract only specifies the bonus paid after receiving the flowers, tq, this latter deviation is clearly less profitable than simply refusing to pay the supplier following delivery.

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 $\left(p-\bar{t}\right)q^*$ 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^*.

Once the corresponding value functions have been computed, it is possible to show that the only relevant constraint for the seller is the one in the high season. The constraint $\overline{IC}^S$, therefore, provides an empirical estimate to a *lower bound* on the value of the relationship for the supplier. From an empirical point of view, the crucial advantage of this estimate is that it only relies on information on volumes and unit prices, which is available in transaction level customs data. In particular, it does not rely on information on the cost structure of the firm, which is instead typically unobservable and/or difficult to estimate. We summarize this discussion with the following:

Claim 1 *An empirical lower bound to the value of the Relational Contract for the supplier,* $\delta\left(\underline{U}-\underline{U}^o\right)$*, is given by* $\left(p-\bar{t}\right)q^*$.[8]

Total Surplus and Sustainability of the Relationship

The first best contract, i.e., a constant order flow of q^*, is sustainable if there are values of the seasonal unit prices $\underline{t}$ and $\bar{t}$ such that the three constraints (2), (3) and (4) can be simultaneously satisfied. By adding the two incentive constraints in the high season, $\overline{IC}^B$ and $\overline{IC}^S$, we obtain a necessary condition for the relationship to be sustainable,

$$\overline{W}=\frac{\delta}{1-\delta^2}\left(\tau(1+\delta)q^*-\frac{c\left(q^*\right)^2}{2}\right)\geq pq^*, \tag{5}$$

where $\overline{W}=\delta\left[\left(\underline{V}+\underline{U}\right)-\left(\underline{V}^o+\underline{U}^o\right)\right]$ is the discounted value of the relationship surplus: in each season the relationship avoids paying intermediation costs τq^* at the cost of producing q^* every low season.[9]

[8] The incentive compatibility constraints have been derived under the assumption that the firm sells a positive quantity of flowers on the spot market in the high season, i.e., $cq^*<p$. If this was not the case, the incentive compatibility in the high season should be rewritten as $\delta\left(\underline{U}-\underline{U}^o\right)\geq\Pi^S(q_{A^*})-\left[\bar{t}q^*-C(q^*)\right]$, where $\Pi^S(q_{A^*})=pq_{A^*}-C(q_{A^*})$. By definition of q_{A^*}, $\Pi^S(q_{A^*})-\left[\bar{t}q^*-C(q^*)\right]>\left(p-\bar{t}\right)q^*$ and therefore $\left(p-\bar{t}\right)q^*$ provides a *lower bound* on the value of reputation for those firms that do not sell positive quantities of flowers to the spot market in the high season.

[9] $\underline{W}$ is defined analogously for the low season.

In order to determine the seasonal unit prices $\underline{t}$ and $\bar{t}$, we assume that the buyer has all the bargaining power at the contracting stage and that, in line with contractual practices in the industry, the contract is negotiated during the low season. The relational contract, therefore, maximizes the buyer's value of the relationship in the low season, $\underline{V}$, subject to the constraints. This amounts to minimize the net present value of unit prices, $\underline{t} + \delta\bar{t}$.

Lemma 2 *If condition (5) holds, there exists a relational contract that guarantees first best constant order flows q^* across seasons.*

A direct implication of the previous Lemma is the following

Claim 2 *The difference in prices between the high and the low season, $\Delta t = \bar{t} - \underline{t} \geq 0$, is an empirical proxy for (the negative of) the surplus available to the relationship, $\overline{W}$. More precisely, let $z \in \{\delta, \tau, c, q^*\}$ be a determinant of $\overline{W}$. If $\overline{W}$ is increasing (resp. decreasing) in z, then Δt is decreasing (resp. increasing) in z.*

The surplus in the relationship is (obviously) i) increasing in δ, ii) decreasing in c, and iii) increasing in τ (i.e., the trade costs the buyer incurs by sourcing on the market). While the surplus available to the relationship is unobservable to the econometrician, the Claim shows that the surplus is negatively related to the difference in unit prices between the two season. This is intuitive: in a relationship with no surplus at all, the buyer could guarantee that the supplier delivers a steady flow q^* by paying the price on the spot market.

Effects of the Shock

We now turn to the effects of a temporary increase in c, to $\widetilde{c}$. We assume that the shock is: i) unanticipated, ii) perceived to be temporary, iii) common knowledge among the two contracting parties, and iv) "sudden", i.e., for the buyer it is too costly to access the spot market. Under those circumstances, the two parties agree to modify the relational contract for the period affected by the shock to maximize the total surplus in the relationship subject to the incentive compatibility constraints that are necessary to sustain the relationship.

We make the following assumption on the shock:

Assumption 2: *The increase in costs* $\widetilde{c}$ *is such that* $q^* > \frac{p+\tau}{\widetilde{c}}$.

The assumption implies that following the shock it is not optimal to source the entire quantity q^* from the supplier. Rather, the optimal quantity would be given by $\widetilde{q}_s = \frac{p+\tau}{\widetilde{c}}$. This optimal quantity, however, might not be feasible, since contracts cannot be enforced. On top of the incentive compatibility constraints described above, an equilibrium deviation from q^* implies that also the *participation constraint* must be taken into account as well.[10]

In particular, while the best possible deviation for the seller remains to access the auctions as before, and therefore only the incentive compatibility constraint can be binding, this will no longer be true for the buyer. On top of paying for the quantity delivered by the seller, as in (3), the buyer must prefer to enter the agreement rather than purchasing from the auctions. Denoting by $\widetilde{t}$ the unit price under the new relational contract and by $l(\widetilde{q})$ the losses incurred by the buyer by deviating from q^*, the participation constraint of the buyer is given by

$$v\widetilde{q} - t\widetilde{q} - l(\widetilde{q}) - k + \delta\left(\underline{V} - \underline{V}^o\right) > \widetilde{\pi}_a,$$

where $\widetilde{\pi}_a = -k$ is the buyer's payoff on the spot market.

The problem of the two contracting parties, therefore, is to choose $\widetilde{q}$ in order to maximize surplus, subject to the implicit contract being self-enforcing. The constraints for the buyer and the seller are respectively given by

$$\widetilde{IC}^B : \delta\left(\underline{V} - \underline{V}^o\right) \geq \widetilde{t}\widetilde{q} + \max\left\{0, l(\widetilde{q}) - v\widetilde{q}\right\}, \tag{6}$$

$$\widetilde{IC}^S : \widetilde{t}\widetilde{q} - \frac{\widetilde{c}\left(\widetilde{q}\right)^2}{2} + \delta\left(\underline{U} - \underline{U}^o\right) \geq \frac{p^2}{2\widetilde{c}}. \tag{7}$$

Summing up the two constraints, i.e., canceling out transfers $\widetilde{t}\widetilde{q}$, a necessary condition for $\widetilde{q}$ to be sustainable is given by

$$\underline{W} \geq \max\left\{0, l(\widetilde{q}) - v\widetilde{q}\right\} + \frac{p^2}{2\widetilde{c}} + \frac{\widetilde{c}\left(\widetilde{q}\right)^2}{2}, \tag{8}$$

which is the modified version of (5) under the cost shock. The constraint (8) has several implications, which are summarized in the following

[10] The assumption that the ex-ante outside option of the two parties is equal to the ex-post fall back option (i.e., after a deviation from the relational contract), implies that in the stationary environment the rents necessary to satisfy the incentive compatibility constraints are sufficient to satisfy the participation constraint as well.

Claim 3 *Firms stop selling on the spot market. Moreover, the volume transacted during the shock, $\widetilde{q}_s$ is*

1. *lower than usual, i.e., $\widetilde{q}_s < q^*$,*
2. *(weakly) increasing (resp. decreasing) in the surplus available to the relationship, $\underline{W}$, if the* incentive compatibility *(resp.* participation*) constraint of the buyer is the relevant one,*
3. *Under the second scenario, $\widetilde{q}_s$ is higher in relationships involving buyers with higher costs of accessing alternative sources of supply* during the period of the violence.

Obviously, the quantity transacted during the shock will be lower than the quantity normally transacted between the two parties, q^* (part 1 of the Claim). The Claim, however, provides some further testable predictions on the volume transacted in the relationship during the time of the shock. In particular, the Claim highlights that, as the surplus available in the relationships increases, the volume transacted might be larger or smaller depending on which constraint is relevant (part 2 of the Claim). If the relevant constraint of the buyer is the incentive compatibility constraint, then the quantity transacted $\widetilde{q}_s$ can be increased in relationships with more surplus because this can be used to transfer rents necessary to the seller to produce a higher quantity under unfavorable costs conditions. If, instead, the participation constraint of the buyer is relevant, relationships with higher surplus will transact a lower quantity since the surplus can be used to make sure the buyer accepts a larger deviation from the preferred quantity q^*. Finally, while a permanent increase in the cost of alternative sources of flowers would increase the surplus in the relationship, and would therefore have an ambiguous impact on $\widetilde{q}_s$, a *temporary* increase in the costs of alternative sources would make it harder for the buyer to accept a deviation from q^*, and would therefore imply a higher $\widetilde{q}_s$ (part 3 of the Claim).

Discussion

The theoretical framework presented above delivers clear cut predictions and guidance to empirically estimate the value of the relational contract at the cost of making simplifying assumptions along several dimensions. First of all, the theory presented a stylized situation in which the buyer and the seller are embedded in a bilateral relationship. In practice, this is not the case, and buyers in our sample source from multiple

producers while some sellers have multiple relationships. It is possible to extend the model to allow the buyer to source from multiple producers (see, e.g., Board (2008)) without affecting any of the qualitative results.

Following an increase in costs, a firm with multiple buyers will however have a different opportunity cost of supplying the buyer, depending on the value of the other relationships. In particular, the convex cost function implies that the surpluses available in the two relationships are not independent. While the interaction between multiple relationships is interesting, it is still the case that in order for a particular relationship to be sustainable, its value must be higher than the gain from selling the agreed quantity on the auctions, as in (4). Abstracting from the interactions between multiple relationships, condition (4), therefore, provides an even more conservative lower bound estimate on the value of the relationship.[11]

Second, we have emphasized throughout a setting in which the quantity $\widetilde{q}$ specified by the relational contract adapts to the shock in order to maximize the joint surplus. This delivers the implication that $\widetilde{q}$ is *positively* correlated with the costs of sourcing from alternative suppliers for the buyers. Alternative models that emphasize bargaining, instead, would tend to predict that the quantity $\widetilde{q}$ *negatively* correlates with those costs. It is therefore possible to distinguish our model from one in which the supplier saves on the additional costs induced by the shock by shading on the volume supplied to a buyer which is in a particularly weak position.

Third, our theoretical framework emphasizes reliability, that we capture by postulating a constant order flow of q^* along the equilibrium path. An alternative model would instead emphasize *insurance*. An insurance model would also suggests that buyers with higher costs of sourcing from alternative suppliers would find it more difficult to provide insurance to the supplier and therefore would predict a higher $\widetilde{q}$. It is unclear, however, whether such a model would imply a negative link between the surplus available to the relationship and the spread in prices throughout the season.

Finally, the economic literature has emphasized two mechanisms that lead to the notions of "trust" and "reputation": one based on repeated interactions the other based on updating of beliefs about unobserved primitives of at least one of the contracting parties. While we have followed the first approach, in a model with asymmetric information, the value of the relationship would be a continuos function of the quantity supplied during the shock $\widetilde{q}_s$, implying that from the response of the firm it

[11] With multiple buyers, the response to the exogenous shock in a given relationship depends on the distribution of bargaining power (with other buyers). Our comparative statics results instead do not depend on the distribution of bargaining power.

would be possible to identify the slope of the value of the relationship but, without further assumptions, it would be impossible to put a lower bound on the value of the relationship.[12]

Summary of Predictions

Let us summarize the main empirical implications derived from the theoretical framework:

1. In response to the negative short-run supply shock, the volume sold by the firm to the spot market drops *more* than the volumes sold to direct buyers,

2. Among direct relationships, the volume transacted drops relatively less (resp., more) for relationships with higher future surplus if the seller's (resp., buyer) constraint is binding.

   The *unobservable* surplus generated by the relationship can be proxied by:

   a) Low variability of prices across high and low seasons, and

   b) higher frequency of transactions,

3. *Permanently* higher costs of accessing alternative sources of supply increase surplus and have the same effect on quantity $\widetilde{q}_s$ as in Point 2. *Temporarily* higher costs of sourcing flowers from alternative sources during the conflict, instead, implies a lower reduction in $\widetilde{q}_s$.

4. A *lower bound* for the value of the relationship is given by the loss in revenues that the firm incurs by not selling on the auctions.

3 Data Description

In this section and the following, we document some of the contractual practices in the industry and provide evidence which is in line with the assumptions and predictions of our model. The data we use come from transaction-level customs data which contains the names of the exporting company as well as the name of the foreign buyer, or consignee. This information allows us to build a panel of relationships with daily data on volumes and prices of flower transacted. We further match those data with

[12] Furthermore, the typically large set of equilibria in models along the tradition pursued here suggests that the two classes of models might not be empirically distinguishable. This topic awaits future research.

a representative survey of the Kenya flower industry that we have conducted through face-to-face interviews in the summer of 2008. Further information about the data is provided in the Appendix.

Contractual Practices

The first ingredient of our theoretical model was to assume that firms rely on repeated transactions and reputation, rather than on written enforceable contracts, to assure good contractual performance. This assumption was motivated by the fact that the perishable nature of flowers makes it unpractical to write and enforce contracts on supplier's reliability.

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 79 producers we have surveyed, 57 of them export some percentage of their production through direct relationships with foreign buyers, while the remaining 22 only sell to the auctions.[13] Among those 57 producers, 35 of them (i.e., 61%) reported of not having *any* written contract with their main direct buyer. Among the remaining 22 firms, many have very loose written contracts with their main buyer. Most of those contracts are automatically renewed every year without any change, and 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.[14] 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. Some firms report to negotiate constant prices with their main buyer throughout the year, others have prices changing two, or even four, times a year, possibly through a catalogue or price list. Furthermore, even though a significant minority of exporters has some kind of written agreement with foreign buyers, 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". The theoretical assumption that contracts cannot be enforced and therefore parties will resume to long lasting relation-

[13] The corresponding figures for the entire sample of 114 firms from the customs data are 75 and 39 respectively. We have also surveyed (and excluded from the analysis) a few Kenyan traders that do not produce flowers.

[14] The contract might even expressely allow for a relatively large percentage (e.g., 20%) of orders to be managed "ad hoc".

ships to ensure good contractual performance is therefore well in line with established practices in the industry.[15]

Short-Run Supply Shock

The second ingredient of the theoretical framework is a short-run unanticipated shock to the production function of firms. This is provided by an intense episode of ethnic violence that affected several parts of Kenya following contested presidential elections at the end of December 2007. The ethnic violence had two major spikes lasting for a few days at the beginning and at the end of January 2008. Crucially from our point of view, 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 North East of Nairobi were not. The main consequence of the violence was that suddenly the firms located in the regions affected by the violence found themselves lacking significant proportions of their workers.[16] We think of the workers absence as 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 the 79 firms surveyed, 40 were located in regions that were affected by the violence. 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 clearly 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. As a consequence of the violence, respondents in the regions affected by the violence reported significant increase in production costs. Mainly, this was due to the fact that wages for extra-hours had to be paid to the remaining workers in order to minimize disruption in production.[17]

With so many workers missing, firms also suffered dramatic reduction in output.

[15] The survey unmistekably reveals that these relationships can be very long lived. Several respondents reported to have had relationships longer than a decade, which seems to be remarkable in such a young industry.

[16] Some firms were also affected by transportation issues. Ksoll et al. (2009) provide further details on the ethnic violence and its overall impact on the industry.

[17] Other costs, such as security and transportation, also increased but still remained small cost components.

Figure [2] plots deseasonalized export volumes during the period of the violence for the two separate groups of firms. 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. Ksoll et al. (2009) estimates the violence to have reduced exports of flowers by 40% in the conflict regions.[18]

In the survey, we asked several questions about whether the violence had been anticipated or not. Not a single respondent among the 79 producers interviewed reported to have anticipated the shock (and to have adjusted production or sales plans accordingly). As hypotized in the theoretical framework, it appears that the violence has been a large, unanticipated and relatively short-run negative shock to the production function of firms.[19]

Relationships Characteristics

Using the customs data, we build a dataset of relationships. We focus on the period October 2007 to March 2008, i.e., the ten weeks before and after the eruption of the violence. This also corresponds, roughly speaking, to the high season in the industry. We define a relationship to be a link between an exporter and a foreign buyer if the two parties transacted at least ten times in the ten weeks before the eruption of the violence, i.e., at least once a week on average.[20]

In total, this leaves us with 186 active relationships in the period under consideration, which we describe in Table [1]. The Table, furthermore, breaks the sample of relationships according to whether the exporter is located in the region affected by the violence or not, and shows that along several observable characteristics the two sets of relationships are not different across regions.

The average relationship had 23 shipments in the first ten weeks of the period. There appears to be a relatively high turnover: only two thirds of the relationships (i.e., 128 of the 186) were active in the same period the year before. Relationships also

[18] The Figure also illustrates that the two group of firms have comparable trends in export volumes. Table A1 further shows that the two groups of firms are similar along several other dimensions. We do not stress those similarities too much since, as it will be clear below, our empirical strategy mainly relies on *within* firm comparisons.

[19] The ethnic violence in Kenya received extensive coverage in the international media (see, e.g., The Economist (2008)) and therefore the common knowledge assumption is also likely to hold. We do acknowledge, however, that at the time the violence happened there might have been significant uncertainty on its expected duration. This is consistent with the reported efforts made by the exporters association to reassure buyers.

[20] Consistent with the emphasis on reliability, the data show clear spikes in the distribution of shipments for relationships at one, two, three, four and six shipments per week in the period under consideration. We use the cutoff to distinguish between relationships versus sporadic orders. The results are not sensitive to the threshold, however.

tend to increase the frequency of shipments as they grow older, as the average number of shipments in the previous year was 15, instead of 23.[21]

In contrast to the assumption of our model, relationships do not appear to be exclusive. In 70% of the relationships, the buyer sources from firms located in both regions. The average number of suppliers to the buyer is between four and five and in only 16% of cases the relationship has an exclusive supplier. On the other hand, the average number of direct buyers across firms is two with 40% of the firms having only one direct relationship.

4 The Value of Relational Contracts

4.1 Evidence From Regressions

This section presents results from regression analysis that are consistent with the predictions of the model. We compare the differences between the volume of flowers transacted in a given relationship during the period of the violence with the volume of flowers transacted in normal times in the same relationship, for firms located across the different regions.

Differences in Response Across Marketing Channels (Within Firms)

The first set of regressions explores the empirical validity of the prediction that shipments to direct buyers suffered a smaller reduction than shipments to the auctions. In other words, we ask whether a particular contractual form matters. Answering this kind of question is challenging because different contractual arrangements are selected by different firms, for different products, in different (time-varying) circumstances (see, e.g., Lafontaine and Slade (2009)). Our empirical strategy solves the selection problem by relying on an exogenous and unanticipated shock to the production function. The the short-run and sudden nature of the shock allows us to control for selection into different contractual arrangements for different products by comparing export volumes in a given relationship during the time of the violence with export volumes in the same relationship in normal times. The empirical specification is given by

$$y_{fb}^{t} = \alpha_t + \gamma_0 \mathbf{V}_{ct} + \gamma_1 \left(\mathbf{V}_{ct} \times \mathbf{D}_b\right) + \mu_{fb} + \varepsilon_{fb}^{t}, \tag{9}$$

where y_{fb}^{t} is exports (logs of kilograms) of firm f, to buyer b at date d. $\mathbf{V}_{ct}$ is a dummy

[21] The average age of active relationships is three years. This estimate is censored, as the custom data only contain data for four years.

that takes value equal to one in the days t and regions c affected by the violence, while the dummy $\mathbf{D}_b$ is an indicator of the type of marketing channels. In particular, exports are classified into two categories: all exports to the Dutch auctions in a given date are consolidated into one observation for which $D_b = 0$ (the auctions can be thought of buyer "zero"). All the remaining shipments to direct buyers, instead, have $D_b = 1$. The coefficient γ_1, therefore, identifies whether, during the period of violence, firms in the regions affected by the violence changed their exports differently to direct buyers compared to the spot market.

The treatment of the error terms deserves a particular mention. There are two main concerns. First, production, and therefore shipments, of a given firm are likely to be correlated with each other.[22] Second, across firms, error terms are likely to be correlated because firms share buyers, which receive demand shocks. In order to take into account both concerns, we cluster the standard errors across both the firm and buyer dimension using the method proposed by Cameron et al. (2009).[23]

Result and Potential Concern

Table [2] shows a differential effect of the violence on the different marketing channels. In particular, "within firms" exports to direct buyers suffered significantly less than exports to the Dutch auctions. The first coefficient shows that, on average, exports showed a significant decline during the period of the violence. The effect is large and statistically significant and implies a reduction in excess of *40 percent* of normal shipments. The second coefficient, however, shows that shipments to direct buyers have suffered significantly less, relatively to the unaffected regions. This evidence suggests that, on average, firms affected by the violence have prioritized exports to direct buyers relative to exports to the auctions.[24]

A possible concern with this specification could arise if firms normally sell flowers on which they make higher margins to direct buyers and, in the presence of capacity constraints induced by the shock, they prioritize those flowers on which they make more

[22] Within a given relationship, error terms are likely to be serially correlated (if a shipment to a particular buyer has occurred today, it is less likely that another shipment to that particular buyer will take place tomorrow). Across relationships within the same firms, error terms are also correlated: if a buyer suddenly needs more flowers, another buyer's supply might be cut down.

[23] Firms also share roads and other infrastructures. We have clustered along geographical dimensions to allow for spatially correlated errors (rather than correlation within buyers). The resulting standard errors were smaller, implying statistically more significant results. Because of the large number of dummies, clustering along the three non-nested dimensions at the same time, instead, gives unstable results.

[24] The various specifications in the Table include different sets of fixed effects to control for potentially different seasonality patterns across different types of marketing channels. Results are stronger when we include data from previous seasons, so that the relative change due to the violence across marketing channels is compared with the same figure for the previous years.

money. We believe this concern is not relavent. First, the result is robust regardless of whether we consider only roses or other types of flowers as well. Within roses, however, there are many varieties that fetch different prices. While the customs data do not allow to identify different types of roses, the evidence suggests that product heterogeneity among roses should, if anything, make it harder for us to find the result. First, the time of the year in which the shock occurred is when prices at the auctions are at their pick (see Figure [3A]). If anything, for a given flower, this is the time in which it is most profitable to sell on the spot market. Second, controlling for the marketing channel, the size of the rose is the main characteristics that drives prices and margins to producers. Because of demand conditions, larger roses tend to be sold prevalently on the spot markets or outside Europe, rather than through direct relationships with European buyers, as illustrated in Figure [4]. The Figure also shows that average stem weight is roughly constant throughout the year. This is consistent with the fact that the size of roses grown is mainly driven by the location, i.e., the altitude, at which the firms are located, so that firms are fairly specialize with respect to the size of roses they produce. Consistently with this fact, Table A2 reports results on the effects of the violence on the average unit weight per shipment. The results clearly show that the violence has had no effect on the type of roses sent to different marketing channels. [25]

Firm Heterogeneity and Complementarity Across Marketing Channels

As mentioned above, there are three different types of firms: firms that only sell to the Auctions, firms that only sell to direct buyers, and firms that sell through both marketing channels. Table [A3] estimate the following regression

$$y_{fb}^{t} = \alpha_t + \delta_0 \mathbf{V}_{ct} + \mu_{fb} + \varepsilon_{fb}^{t},$$

on three different samples of direct relationships. The Table focuses on firms located in the regions affected by the violence. Column (1) focuses on the direct relationships of all firms and finds that, on average, shipments to direct buyers have suffered a reduction during the time of the violence. Columns (2) and (3) replicate the excercise splitting the sample of firms into two. Column (2) focuses on the effects of the violence on firms

[25] A second potential concern arise if firms normally outsource/outgrow flowers from other firms/producers, and if this has happened particularly during the time of the violence. We have asked several detailed questions in the survey, both on whether the firm outsources/outgrows flowers and sells flowers to other producers during normal times as well as during the time of the violence. The interview clearly revealed that outsourcing is extremely uncommon and that firms did not resort to this during the violence.

that routinely sell also to the auctions, while Column (3) presents the result for firms that normally do not sell to the auctions. 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 mantain 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 mantain a constant supply to their customers. In other words, in risky environments the two marketing channels should be seen as complements, rather than substitutes.[26]

Relationships Heterogeneity: the Role of Available Surplus

We now turn to the model's implications regarding the comparison across heterogenous relationships. The first implications is that, as a consequence of the shock, the volume transacted decrease more or less in relationships with higher surplus depending on whether the buyer's or the seller's constraint is binding.

We use two alternative proxies for the surplus (both suggested by the model). The first proxy is given by (minus) the difference in average prices between the high and low season, within a given relationships. Column 1 in Table [3], therefore, interacts the shock with a dummy which takes value equal to one if the average prices in the relationship were constant during the high season from December 2006 to February 2007 and in the low season from June to August 2007.[27] The Table finds a negative, large and statistical significant effect of the interaction: on average, relationships that had constant prices throughout the previous year experience a larger drop in volume due to the violence. Interpreted in the light of the model, the evidence suggests that the buyer's constraint was binding for the average relationship, and therefore, the higher surplus available was used to give incentives to the buyer to "swallow" a larger deviation from the desired quantity.

A second proxy for the surplus available in the relationship is the frequency of shipments per week in the first ten weeks of the season. Figure [5] shows that there is a lot of regularity in shipments frequency: the average number of shipments in the first ten weeks explain 90% of the within firm variation in shipments during the 10 weeks

[26] Concersely, (unreported) results show that sales to the auctions went down more for those firms that normally sell to direct buyers, relative to firms that only focus on the auctions. Substituting shipments away from the auction was one of the two effort dimentions along which firms could have adjusted shipments to direct buyers. We document the second dimension - exerting effort to keep workers - below.

[27] This implies that we loose a few relationships since some relationships were not active during the high season. Obviously, we cannot use the average prices in the high season in which the conflict takes place.

from beginning of January and end of March in 2007. The frequency of shipment at the beginning of the season, therefore, is a good empirical proxy for the (expected) number of future interactions, i.e., for δ.[28] Consistently with the finding in Column 1, in Column 2 we find that relationships with more frequent transactions suffer a larger reduction in the volumes of exports.

A second set of predictions regards the distinction between *permanently* vs. *temporarily* (i.e., during the time of the conflict) higher costs of sourcing from alternative suppliers. Permanently higher costs *increase* the surplus available in the relationships, and therefore should behave as the two proxies for the surplus. Higher temporary costs of accessing alternative sources of supply, instead, should increase the volume transacted, since for the buyer it is more costly to "swallow" a larger deviation from the desired shipment.

We proxy permanently and temporarily higher costs in sourcing from alternative suppliers in the following way. First, buyers that are located in Holland are closer to the auctions, and therefore have a permanently lower cost of accessing alternative sources of supply: the surplus in those relationships will be lower, and therefore we should find lower drop in the quantity transacted. Second, buyers that only have relationships with firms located in the conflict regions experience a temporarily larger increase in the costs of accessing alternative sources, since all their suppliers are being affected by the violence. Columns 3 and 4 in Table [3] find strong empirical support for both predictions. In particular, relationships with both buyers located in Holland as well as relationships with buyers that only source from firms located in the conflict region experience a smaller drop in the volume transacted due to the violence.

4.2 Estimating the Value of Relational Contracts

Evidence from the Incentive Constraint

So far we have provided evidence that supports the assumptions as well as the predictions of the model. We now use the model to estimate a lower bound on the value of a direct relationship for the seller. The incentive constraint for the seller (4) 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

[28] In a model in which there is uncertainty over the reliability of the supplier, the frequency of past shipments could also be a proxy for the probability that the buyer (or the two parties) assign to the seller being reliable. This is positively related to the surplus available in the relationship.

bringing this estimate to the data, we need to i) make a reasonable choice with respect to the relevant "deviation window", and ii) normalize the value of the relationship.

For each relationship i we compute the lower bound as

$$\mathbf{V}_i = \frac{\max_{\mathcal{W}} \left\{ \left(p_{t \in \mathcal{W}} - t_{i,t \in \mathcal{W}} \right) q_{i,t \in \mathcal{W}} \right\}}{\sum t_{it} q_{it}}, \tag{10}$$

where p_t is the price at the auctions at date t, $t_{i,t}$ is the unit price in relationship i at date t and $\mathcal{W}$ is the relevant "deviation window", described below. We normalize the value of the rents by $\mathbf{R}_i = \sum t_{it} q_{it}$, the yearly turnover in the relationship. We restrict attention to the entire year 2007, i.e., before the conflict took place and to relationships with positive shipments in at least twenty five weeks throughout the year. The operator $\max_{\mathcal{W}}$ gives the highest temptation to renege during the relevant period: the model clearly states that only the incentive compatibility constraint in the pick season is binding.

We provide results for three different choices of the relevant "deviation window" $\mathcal{W}$. The first measure, $\mathbf{V}_i^1$, takes a constant deviation window of one week across all the relationships. The second measure, $\mathbf{V}_i^2$, instead, takes a constant deviation window of three shipments across all the relationships. The three shipments threshold is chosen since on average the relationships in the sample have had 2.5 shipments per week throughout the relevant period. Finally, a third measure, $\mathbf{V}_i^3$, sets the "deviation window" to the average number of shipments per week in a given relationship.

For the 87 relationships left in the sample, Panel A of Table [4] reports summary statistics for the three different measures $\mathbf{V}_i^{\cdot}$. We find that the lower bound to the value of the relationship is equal to approximately 5% of the yearly turnover for the median firm, and it is between 7% and 8% on average. Panel B of Table [4] shows that the three different measures are highly correlated with each other. Figure [6] plots the distribution of the estimated lower bounds (in logs) and shows that it is well approximated by a log-normal distribution.

It is hard to establish whether 7% of yearly revenues is a large number or not. If there was free entry in the formation of relationships, initial sunk investments would dissipate the ex-post rents. 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.[29]

It is worth stressing that our estimates are likely to be a very conservative lower bound. The number would be mechanically higher if we had chosen a longer "deviation window". From conversations with practitioners it seems plausible that a "deviation period" of two weeks, instead of one, is likely to be more appropriate, in the sense that buyers would probably not interrupt relationships for failure of appropriate delivery that lasted only one week. (Unreported) results show that doubling the length of the "deviation window" gives a lower bound estimate in the order of 10%, while considering a three weeks period gives an estimate of 12% of yearly revenues. In both cases, the three different measures would still be highly correlated with each other and with the corresponding measure computed with shorter windows.

Structural Evidence from the Response to the Shock

Note: Still to Be Done !! *If one is willing to make functional form assumption on the shape of the cost function and to use price information from the period of the conflict, it is possible to use the estimated coefficient to back up the increase in costs, and by implication the value of the relationship. We want to do this since (for firms selling at the auctions) $p = MGCost$ implies that we have a lot of data to estimate firm's specific cost functions (e.g., by minimum distance).*

What Makes a Good Relationship?

Note: Still to Be Done !! *In a nutshell, we would like to see which firm's, buyer's and relationship's characteristics correlate with the estimated value.*

4.3 Further, Indirect Evidence, on the Value of Relational Contracts

Finally, we present some further indirect evidence on the value of relationships. If relationships are valuable, firms should have exerted effort to minimize disruptions in supplies to direct buyers. A first dimension along which firms have exerted effort was to abstain from selling to the auctions, as documented above. A second possible dimension of effort was to keep the workers coming to the farm during the period of the violence.[30]

Using data from the survey we conducted in Kenya, Table [5] shows that among the firms located in the regions affected by the violence those that specialize in selling to

[29] The figure for the initial sunk costs is between 18 to 42%.

[30] The survey reveals that firms could not replace workers and did not source from alternative, unaffected, firms.

direct buyers have lost a significantly lower proportion of workers during the conflict. The effect is large. On average firms located in the violence region have experienced absence of up to 50% of their labor force at the pick of the violence. Among those firms, however, firms that specialize in direct relationships experienced only one third of the average reduction in workers experienced by firms specializing in sales to the auctions.[31]

Despite the possibility that omitted variables might correlate with the choice of marketing channels as well as with a firm's exposure to the violence, a number of facts make us relatively confident in interpreting the reported correlation in a causal way (i.e., firms engaging in direct relationships have exerted effort to keep their workers). Bearing in mind the small sample size, the appropriately designed survey allows us to control for many of the possible competing explanations. In particular, we can control for the determinants of the firm's marketing strategy,[32] as well as for a variety characteristics of a firm's labor force. Column 4 includes several characteristics of the labor force employed by the firm in the month before the violence, including variables related to education, gender, ethnicity, contract type and housing programs. While firm employing higher percentages of temporary workers experience higher losses, and firms with housing programs experience lower losses, the results on the marketing strategy are extremely robust.[33]

Furthermore, field interviews revealed that many firms financed, organizing supplies and transport to and from, camps for internally displaced people (IDP) that were set up at several locations in the regions affected by the violence. In Naivasha, the main hub of the industry, flower firms significantly contributed to setting up a large IDP camp which was located in front of one of the largest producers in a strategic position that avoided workers having to go home crossing the main road, where most of the violence was taking place.

[31] Results reported in Ksoll et al. (2009) show that firms specializing in direct sales experience a significantly smaller loss in *total* volume exported as well as in self-reported revenues due to the crisis.

[32] (Unreported) results show that location, product variety and ownership patterns are the main variables that correlate with marketing channels.

[33] Capital intensity and access to credit are other unobservable variables which could potentially drive a correlation between choice of marketing strategy and exposure to the violence. Interviews in the field revealed that ownership of insulated trucks and owner's identity are good proxies for the two variables respectively.

5 Policy Implications and Conclusions

Combining a transaction level database of exports of flowers with an exogenous shock to Kenya exporters, we have provided quantitative evidence on the value of long term relationships in export markets. We have documented that transactions volumes respond to a short-run supply shock consistently with the predictions of a relational contracting model. We have then used the theoretical framework to provide a lower bound to the value of the relational contract and found that the net present value of the future rents necessary to enforce the relational contract are at least worth 7% of the yearly turnover for the average relationship.

While derived in a special context, Kenya flowers exports during an episode of ethnic violence, the results yield several policy implications that are relevant in other contexts.[34] From the point of view of policies directed at export promotion, the paper shows that not just *what* is exported, but *how* it is exported matters too (see, e.g., Hausman et al. (2005)). 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 [7] plots the share of the value of a country exports in commodities that are exported through direct relationships against per capita GDP in 2000.[35] 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.

In other words, the development process involves a change in the organizational form of a country's exports, and the experience of the flower industry lies at the interface of this transformation. The results in the paper emphasize the potential complementarity between the two forms of exports. 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.[36] To the extent that the emphasis on reliability in global supply chain and/or the contractual imperfections which are exacerbated by crossing national borders imply constant prices and orders in the relationship with foreign buyers, access to a spot market might be particularly

[34] 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.

[35] 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.

[36] The optimal distribution of the share of exports to the spot markets across firms, therefore, should be unimodal. This is in contrast with the bimodal distribution observed in the Kenya flower industry, in which firms tend to specialize in their choice of marketing channels.

valuable.[37]

Furthermore, the evidence of rents associated with long term relationships is consistent with the importance of entry costs in export markets (see, e.g., Das et al. (2007)). 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. A more likely scenario in developing countries, however, is that various sources of market imperfections (e.g., in the credit markets) limit entry in export markets for some firms. In contrast to credit and other forms of export subsidies, policies directed at lowering the costs of starting new relationships, such as common marketing, 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 from the traditional view. For this reason, it might be important to empirically distinguish models of trust and reputation based on repeated interactions from models based upon the update of beliefs on unobserved primitives on the quality of the transaction parties. We see this as a priority for future work.

[37] Newbery and Stiglitz (1982) have emphasized that, in the presence of uninsurable supply shocks, price insurance might actually reduce producers welfare since incomes are in part automatically insured by the fact that supply is upward sloping.

References

[1] Andrabi, T., M. Ghatak and A. Kwhaja (2006) "Subcontractors for Tractors: Theory and Evidence on Flexible Specialization, Supplier Selection, and Contracting", *Journal of Development Economics*, April 79 (2): 273-302.

[2] Banerjee, A. and E. Duflo (2000) "Reputation Effects and the Limits of Contracting: A Study of the Indian Software Industry", *Quarterly Journal of Economics* 115: 989-1017.

[3] Banerjee, A. and K. Munshi (2004) "How efficiently is capital allocated? Evidence from the knitted garment industry in Tirupur". *Review of Economic Studies* 71(1): 19-42.

[4] Board, S. (2008) "The Value of Loyalty", UCLA mimeo.

[5] Cameron, C., J. Gelbach and D. Miller (2008) "Robust Inference with Multi-way Clustering", mimeo, University of California-Davis.

[6] Das, M., M. Roberts and J. Tybout (2007) "Market Entry Costs, Producer Heterogeneity and Export Dynamics", *Econometrica*, vol. 75(3), pages 837-873.

[7] Eaton, J., S. Kortum and F. Kramarz (2008) "An Anatomy of International Trade: Evidence from French Firms", *NBER WP* 14610.

[8] Egan, M.L. and Mody, A. (1992) "Buyer-Seller Links in Export Development", *World Development*, 20, 321-34.

[9] Fama, E. (1980) "Agency Problems and the Theory of the Firm", *Journal of Political Economy*, 88(2): 288–307.

[10] Gereffi, G. (1999) "International trade and industrial upgrading in the apparel commodity chain", *Journal of International Economics*, 48, 37–70.

[11] Greif, A. (2005) "Commitment, Coercion, and Markets: The Nature and Dynamics of Institutions Supporting Exchange." In Handbook of New Institutional Economics, ed. C. Menard and M. M. Shirley. New York: Springer.

[12] Hausmann R., J. Hwang, and D. Rodrick (2005) "What You Export Matters", mimeo Harvard.

[13] Klein, B. and K. Leffler (1981) "The Role of Market Forces in Assuring Contractual Performance", *Journal of Political Economy*, 89(4): 615–41.

[14] Kranton, Rachel E. 1996. "Reciprocal Exchange: A Self-Sustaining System." American Economic Review, 86(4): 830–51.

[15] Kranton, R. and Swamy, A. (2007) "Contracts, Hold-Up and Exports: Textiles and Opium in Colonial India", *American Economic Review*, forthcoming.

[16] Ksoll, C., R. Macchiavello and A. Morjaria (2009) "*Guns N' Roses*: an Anathomy of the Effects of Ethnic Violence on Kenya Flower Exports", mimeo Oxford.

[17] Lafontaine, F. and M. Slade (2009) "Inter-Firm Contracts: Evidence", forthcoming in R. Gibbons and J. Roberts (Eds.), Handbook of Organizational Economics, Elsevier.

[18] Macaulay, S. (1963) "Non Contractual Relations in Business: A Preliminary Study", *American Sociological Review* 28: 55-67.

[19] Macchiavello, R. (2007) "Reputation Formation in a Growing Industry: Chilean Wine in the UK", mimeo, Oxford University.

[20] McMillan, J. and C. Woodruff (1999) "Inter rm Relationships and Informal Credit in Vietnam", *Quarterly Journal of Economics*, 114: 1285-1320.

[21] MacLeod, W. and J. Malcomson (1989) "Implicit Contracts, Incentive Compatibility, and Involuntary Unemployment." *Econometrica*, 57(2): 447–80.

[22] Munshi, K. (2008) "The Birth of a Business Community: Historical Disadvantage and Contemporary Mobility in India", mimeo Brown Univ.

[23] Newbery, D. and J. Stiglitz (1982) "Risk Aversion, Supply Response, and the Optimality of Random Prices: A Diagrammatic Analysis", *Quarterly Journal of Economics*, vol. 97(1), pages 1-26.

[24] Rauch, J. E. (1999) "Business and Social Networks in International Trade", *Journal of Economic Literature*, 39(4), 1177–1203.

[25] Shapiro, C. (1983) "Premiums for High Quality Products as Returns to Reputations" *Quarterly Journal of Economics*, 98(4): 659–79.

[26] The Economist (2008), "Kenya's flower industry: Roses are red", February 7^{th}, 2008, Nairobi.

6 Appendix A [Preliminary!]

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 $p > \tau$.■

Derivation of Buyer's Constraints

The values of the relationship for the buyer are given by

$$\overline{V} = \frac{\left((1+\delta)v - \overline{t} - \delta\underline{t}\right)}{1-\delta^2} q^* \text{ and } \underline{V} = \frac{\left((1+\delta)v - \underline{t} - \delta\overline{t}\right)}{1-\delta^2} q^*. \tag{11}$$

If the buyer decides to renege on the implicit contract, she will purchase flowers from the auctions forever. Since there is no obligation there, in each period the buyer will choose q_a to maximize her period profits. In each period the buyer chooses q_a to maximize

$$\max_{q_a} vq_a - \frac{(q_a - q^*)^2}{2} - k\mathbf{I}_{q_a \neq q^*} - (\tau + p)\, q_a.$$

This gives $q^a = (v - p - \tau) + q^*$ with corresponding profits $\Pi^a(p) = \frac{(v-p-\tau)}{2}(v - p - \tau + 2q^*) - k$. These profits have to be compared with the profits of purchasing q^* on the spot market, which are given by $(v - p - \tau)\, q^*$. This second option is better if $k > \frac{(v-p-\tau)^2}{2}$ which is always the case, by Assumption 1. The corresponding value functions are given by $\underline{V}^o = (v - \tau)\, q^* + \delta\overline{V}^o$ and $\overline{V}^o = (v - p - \tau)\, q^* + \delta\underline{V}^o$. Solving the two equations

gives This strategy gives

$$\underline{V}^o = \frac{(v-\tau)(1+\delta)-\delta p}{1-\delta^2} q^*, \text{ and } \overline{V}^o = \frac{(v-\tau)(1+\delta)-p}{1-\delta^2} q^*. \tag{12}$$

The incentive compatibility in the text are then derived, after some manipulation, by substituting (11) and (12) in 1.■

Derivation of Seller's Constraints

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

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

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 the main text.

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:

$$\overline{U} = \frac{\overline{\Pi}(q^*) + \delta\underline{\Pi}(q^*)}{1-\delta^2} \text{ and } \underline{U} = \frac{\underline{\Pi}(q^*) + \delta\overline{\Pi}(q^*)}{1-\delta^2}. \tag{13}$$

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:

$$\overline{U}^o = \frac{1}{1-\delta^2}\frac{p^2}{2c} \text{ and } \underline{U}^o = \frac{\delta}{1-\delta^2}\frac{p^2}{2c}. \tag{14}$$

The incentive compatibility can be derived, after some manipulation, by substituting (13) and (14) in 4. This gives

$$\overline{IC}^S : \delta\left(\underline{t}q^* - C(q^*)\right) \geq \left(p - \overline{t}\right)q^*, \tag{15}$$

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

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 $p > \overline{t}$, which will be proven to hold below.■

Sustainability Condition and Derivation of Seasonal Prices

In each season, the constraints for the buyer and the seller can be rewritten as inequalities involving the net present value of unit prices. Denoting by $c^* = \frac{C(q^*)}{q^*} < p$ the average cost at q^*, the constraints can be rewritten as

$$\delta\left(\tau(1+\delta) + \delta p\right) \geq \overline{t} + \delta\underline{t} \geq p + \delta c^*, \tag{16}$$

$$\delta\left(\tau(1+\delta) + p\right) \geq \underline{t} + \delta\overline{t} \geq c^* + \delta p. \tag{17}$$

Since $\delta < 1$ and $p > c^*$, the constraint (16) is necessary and sufficient for the first best production plan to be sustainable. Rewriting the constraint, the necessary condition is given by $\frac{\delta}{(1-\delta^2)}\left(\tau(1+\delta) - \delta c^*\right) \geq p$, as in the text.

To Be Finished! Assuming set prices to share the surplus equally across seasons, we have $\underline{t} = \alpha\frac{cq^*}{2} + (1-\alpha)\delta\left(p+\tau\right)$, $\overline{t} = p\alpha + \tau\delta(1-\alpha)$ and therefore $\Delta t = \alpha(p - \frac{cq^*}{2}) - p\delta(1-\alpha)$.■

Proof of Claim 2

The sign of $sign\left|\frac{\partial\overline{W}}{\partial z}\right|$, for all $z \in \{\delta, \tau, c, q^*\}$, follows from straightforward differentiation of the left hand side of 5. The Claim is then proved by showing that $\frac{\partial\Delta t}{\partial\delta} < 0$, $\frac{\partial\Delta t}{\partial c} > 0$, $\frac{\partial\Delta t}{\partial\tau} < 0$ and $\frac{\partial\Delta t}{\partial q^*} < 0$. Taking the appropriate derivative, we obtain $\frac{\partial\Delta t}{\partial c} =$

$\frac{\delta}{1-\delta}\frac{q^*}{2} > 0$, $\frac{\partial \Delta t}{\partial c} = -\frac{\delta}{1-\delta}(1+\delta) < 0$ and $sign\left|\frac{\partial \Delta t}{\partial \delta}\right| = -sign\left|-2\tau\delta^2 + 4\tau\delta + 2\tau - cq\right|$. $\delta^2 < 2\delta$ and $\frac{cq^*}{2} < \tau$ imply that $\frac{\partial \Delta t}{\partial \delta} < 0$.■

Proof of Claim 3

The problem of the two contracting parties is to choose $\widetilde{q}$ in order to maximize surplus, subject to the constraints implied by the fact that the implicit contract ought to be self-enforcing. The problem is given by

$$\max v(\widetilde{q}+\widetilde{q}_a) - \frac{(\widetilde{q}+\widetilde{q}_a-q^*)^2}{2} - k\mathbf{I}_{\widetilde{q}+\widetilde{q}_a\neq q^*} - \widetilde{q}_a(p+\tau) - \frac{\widetilde{c}\,(\widetilde{q})^2}{2}$$
$$s.t.\begin{cases} \delta\left(\underline{V}-\underline{V}^o\right) \geq \overline{t}\widetilde{q} & IC_B, \\ \overline{t}\widetilde{q} - \frac{\widetilde{c}(\widetilde{q})^2}{2} + \delta\left(\underline{U}-\underline{U}^o\right) \geq \frac{p^2}{2\widetilde{c}} & IC_S. \end{cases}$$

First, it is easy to see that the constraint of the buyer cannot be binding. The original relational contract satisfied $\delta\left(\underline{V}-\underline{V}^o\right) \geq \overline{t}q^*$. A shock that is expected to last only one period does not change the left hand side of the constraint. Under the assumption that prices are not renegotiated, the right hand side ought to be smaller since the solution $\widetilde{q} \leq \frac{p+\tau}{\widetilde{c}} < q^*$. Once this is taken into account and the values of $\overline{t}, \underline{t}$ and $\widetilde{q}_a$ have been substituted in the original problem, the buyer's problem is given by

$$\max \widetilde{q}(p+\tau) - \frac{\widetilde{c}\,(\widetilde{q})^2}{2},\ \text{s.t.},\ \overline{t}\widetilde{q} - \frac{\widetilde{c}\,(\widetilde{q})^2}{2} + \delta\Theta \geq \frac{p^2}{2\widetilde{c}},$$

where $\Theta = \frac{\underline{t}-\frac{cq^*}{2}+\delta\left(\overline{t}-p\right)}{1-\delta^2}q^*$. If the constraint is not binding, then $\widetilde{q} = \frac{(p+\tau)}{\widetilde{c}}$. If, instead, the constraint is binding, then the maximization problem can be rewritten as

$$\max \widetilde{q}\left(p+\tau-\overline{t}\right).$$

Since $\overline{t} < p < p+\tau$, the solution is to set the highest possible $\widetilde{q}$. This value is implicitely defined by the constraint and is given by

$$\widetilde{q} = \frac{1}{\gamma}\left(\overline{t} + \sqrt{\underline{t}\left(\underline{t}+2\left(q^*\gamma-p\right)\right)}\right).$$

The constraint, therefore, is binding if $\widetilde{q} < \frac{p+\tau}{\gamma}$, and therefore the optimal quantity is given by $\widetilde{q} = \min\{\frac{p+\tau}{\gamma}, \frac{1}{\gamma}\left(\overline{t} + \sqrt{\underline{t}\left(\underline{t}+2\left(q^*\gamma-p\right)\right)}\right)\}$. Finally, the comparative statics are trivial. $\frac{\partial \widetilde{q}}{\partial \gamma} < 0$ is easily established by direct differentiation. $\frac{\partial \widetilde{q}}{\partial \tau} > 0$, $\frac{\partial \widetilde{q}}{\partial q^*} > 0$ and $\frac{\partial \widetilde{q}}{\partial \delta} > 0$ all follow from the fact that $\frac{\partial \Theta}{\partial x} > 0$ for $x \in \{\tau, q^*, \delta\}$.■

7 Appendix B

We analyze data on exports of flowers from Kenya. The data is a *daily-transaction-level* dataset covering all exports of flower during the period from September 2004 to August 2008. 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. For further details on the HCDA data please refer to work by Ksoll et al (2009). Because seasonal patterns are important, we restrict our sample to established exporters that export throughout most of the season. Among those, we focus on firms that have exported in December 2006 and January 2007 as well as in November and December 2007, and abstract from entry and exit of firms in export markets. There are approximately 120 producers satisfying those requirements and they cover more than ninety percent of all exports in our dataset. A firm-level survey was designed by the authors to cover a broad range of issues and was administrated and implemented by the authors in July to September 2008. The survey was administrated to the most senior person at the firm, which on most occasions was the owner. Upon previous appointment, face-to-face interviews of one to two hours were conducted by the authors with the respondent. Of the 120 regular exporters in the industry, a representative sample of around eighty firms located in all the producing regions of the country were surveyed. For the universe of 120 established exporters in the industry, we have obtained exact geographical location, ownership details (whether the owner is a indigenous Kenyan, Kenyan Indian or Foreign) and also whether the owner is politically connected. Further details on the data can be found in the Appendix of Ksoll et al (2009). Auction data is obtained at the weekly level from the International Trade Centre, UNCTAD/WTO, Geneva.

Descriptive Statistics

Table 1: *Firm-Buyer Relationship* in Areas with and w/out Conflict

Variable	Observations	Median/Mean in No-Conflict	St Dev. No-conflict	Median/Mean in Conflict	St Dev. Conflict	p-value
Characteristics at the Firm-Buyer Relationship level						
Number of Shipments (Beginning Season 4)	186	23.00	19.36	28.50	21.35	0.46
Number of Shipments (Conflict Period Season 3)	128	15.00	10.72	15.00	9.81	0.98
Share of Export to Most Important Buyer	186	0.12	0.33	0.18	0.39	0.46
Age of Relationship (all 4 seasons)	186	2.97	1.05	3.12	1.26	0.38
Buyer sources only from Conflict Region	186	0.11	0.28	0.05	0.22	**0.1***
Buyer sources from No-Conflict Region	186	0.06	0.24	0.06	0.24	0.95
Buyer sources from both Regions	186	0.73	0.45	0.71	0.45	0.73
Buyer share from the Conflict Region	186	0.41	0.31	0.38	0.29	0.88
Number of Relationships Buyer has	186	4.00	7.84	5.00	8.64	0.27
Relationship is exclusive	186	0.15	0.36	0.18	0.39	0.60
Characteristics at the Firm level						
Share of Direct Buyer	65	0.97	0.30	0.99	0.23	0.68
Number of Relationships (in Season 4)	65	2.00	2.69	2.00	1.91	0.64
Dummy whether Firm has exclusive Buyer Relationship	65	0.32	0.48	0.48	0.51	0.22

Notes: ***, **, * mean statistical significance at the 1, 5 and 10 %-level respectively. The Table tests differences in sample-means for several characteristics at the relationship level i.e. the unit of observation is a *firm-buyer pair* and at the *firm level* across regions affected by the conflict and those regions unaffected by the conflict. Data at the *firm-buyer* relationship level is obtained by building a relationship panel data from the transaction level data of the offical trade statistics for the October 2007 to March 2008, i.e., the 10 weeks before and after the eruption of the violence. A *firm-buyer* relationship is a link between an exporter and a foreign buyer if the two parties transacted at least ten times in the ten weeks before the eruption of the violence, i.e. at least once a week. (Source: HCDA).

Table 2: Marketing Channels-Within Firm Results

Dependent Variable = Log (1 + daily export's in kgs of firm *f* to buyer *b* on day *d*)

	(1)	(2)	(3)
Days of violence * conflict location	-0.933***	-0.933***	-0.928***
	(0.160)	(0.160)	(0.160)
Days of violence * conflict location * direct exports	0.773***	0.775***	0.701***
	(0.205)	(0.202)	(0.226)
FIXED EFFECTS			
day of the week * conflict location	Yes	Yes	Yes
firm-direct	Yes	No	No
direct-week	Yes	Yes	Yes
relationship	No	Yes	Yes
SAMPLE			
More than 4 transactions in the first 10 weeks of the Sample	No	No	Yes
Only firms selling to *BOTH* auctions and Direct Buyers	No	No	No
Observations (firm-transaction)	35710	35710	29984
No. of Relationships	245	245	175
No. of Firms	73	73	73
Adj R- sqrd	0.349	0.472	0.438

Notes: ***, **, * means statistical significance at the 1, 5, 10 %-level respectively. Standard errors are clustered at the buyer-week and relationship level and reported in parenthesis. Days of violence are 30th December 2007 to the 3rd January 2008 and 25th January 2008 to 30th January 2008. The sample period covers the twenty weeks from 20th October 2007 to the 9nd of March 2008. Day of the week dummies are Mondays, Tuesdays, .. Sundays. Direct exports is a dummy that takes value equal to one if the flowers are not exported to an auction house. The sample of firms includes the established producers and excludes traders of flowers as well as the four largest firms. (Source: HCDA, Origanl firm-level survey, see Data Appendix for other variables). Column (3) is on the sub-sample whereby within a relationships there has been more than 4 transactions in the first 10 weeks of the sample period.

Table 3: Relationship Heterogeneity

Dependent Variable = Log (1 + daily export's in kgs of firm *f* to buyer *b* on day *d*)

	(1)	(2)	(3)	(4)
Days of violence	-0.513***	0.0604	-0.334***	-0.311**
	(0.170)	(0.123)	(0.125)	(0.141)
Days of violence * - Δt	-0.463**			
	(0.205)			
Days of violence * dummy =1 if 1 to 3 shipments per Week		-0.118		
		(0.152)		
Days of violence * dummy =1 if 3 to 7 shipments per Week		-0.895***		
		(0.269)		
Days of violence * dummy =1 if Buyer Only Sources from Conflict Region			0.373*	
			(0.232)	
Days of violence * dummy =1 if Buyer located in Holland				0.111
				(0.244)
FIXED EFFECTS				
day of the week	Yes	Yes	Yes	Yes
week	Yes	Yes	Yes	Yes
relationship	Yes	Yes	Yes	Yes
SAMPLE: Only firms in Conflict Region & Direct Relationships	Yes	Yes	Yes	Yes
Observations (firm-transaction)	10789	12240	12368	12368
No. of Relationships	87	101	108	108
Adj R- sqrd	0.410	0.408	0.405	0.405

Notes: ***, **, * means statistical significance at the 1, 5, 10 %-level respectively. Standard errors are clustered at the buyer-week and relationship level and reported in parenthesis. Days of violence are 27th December 2007 to the 3rd January 2008 and 25th January 2008 to 30th January 2008. The sample period covers the twenty weeks from 20th October 2007 to the 2nd of March 2008. Day of the week dummies are Mondays, Tuesdays, .. Sundays. The sample of firms includes the established producers and excludes traders of flowers as well as the four largest firms. Frequency of shipment, Buyer Only sources from Conflict Region dummy and Buyer located in Holland is information from offical trade statistics, Δt is as defined in Claim 2 in the text. (Source: HCDA, Originl firm-level survey, see Data Appendix for other variables).

Table 4: Value of Relational Contract

Panel A: Summary Statistics

	V1	V2	V3
Mean	0.0797	0.0752	0.0765
Median	0.049	0.048	0.048
St Dev	0.096	0.093	0.092
No. of Relationships	87	87	87

Panel B: Correlation Matrix

	V1	V2	V3
V1			
V2	0.9331 [0.000]		
V3	0.9521 [0.000]	0.9764 [0.000]	

p-value in [ ]

Table 5: Marketing Channels and Firm Characteristics

Dependent Variable = % Workers Lost for firm *f*

OLS Estimation , Robust Standard Errors

	(1)	(2)	(3)	(4)
Only Direct Relationships =1	**-32.85***	**-33.64****	**-32.48****	**-37.08****
	(17.74)	**(14.25)**	**(13.48)**	**(13.44)**
Both Direct Relationships + Auction =1	7.73	-13.17	-13.95	**-22.24***
	(11.89)	(10.94)	(12.26)	**(11.57)**
Land (Log Ha)	**-6.27****	-0.79	1.25	3.069
	(2.75)	(0.354)	(3.89)	(3.86)
Only Roses =1	-3.409	-11.13	-11.54	-17.26
	(12.25)	(12.09)	(12.86)	(12.95)
Politically connected firm =1	-21.3	-16.82	-12.93	-20.05
	(15.35)	(14.70)	(15.27)	(13.82)
% of Female Workers		0.477	0.316	0.548
		(0.31)	(0.31)	(0.35)
% of Temporary Workers		**0.142*****	**0.152****	**0.194*****
		(0.050)	**(0.059)**	**(0.054)**
% of Workers with Primary Education		0.205	0.295	0.294
		(0.286)	(0.274)	(0.249)
% of Kikuyu Workers		-0.23	-0.168	-0.160
		(0.26)	(0.255)	(0.228)
Housing =1		**-29.72****	**-32.71****	**-30.95****
		(13.22)	**(13.38)**	**(11.87)**
Fair Trade Certification =1			-0.982	5.25
			(15.59)	(14.79)
KFC Member =1			-15.29	-12.02
			(9.49)	(10.93)
Indian Owner =1				-8.63
				(13.68)
Foreign Owner =1				**-30.3****
				(11.99)
Year of Firm Creation				-0.249
				(1.19)
FIXED EFFECTS				
Location (7 dummies [8-1])	Yes	Yes	Yes	Yes
SAMPLE				
Interviewed firms in Violence areas only	Yes	Yes	Yes	Yes
Only - surveyed sample	Yes	Yes	Yes	Yes
Excluding 4 largest firms	Yes	Yes	Yes	Yes
Observations (firms)	40	40	40	40
Pseudo R-squared	0.2992	0.6958	0.7204	0.7964

Notes: ***, **, * means statistical significance at the 1, 5 and 10 %-level respectively. The dependent variable, % workers lost is the highest percentage reported by the firm throughout the period the violence occured, this variable is obtained from the orignal firm level survey conducted by the authors. Only Direct Relationships is a dummy that takes value equal to one if more than 90% of the export volume of the firm went to direct buyers. All the control variables (except Ownership) are from the firm level survey conducated by the authors. (Source: HCDA, Orignal Survey of Firms, see Data Appendix on Ownership).

Table A1: Firms in Areas with and w/out Conflict

Variable	Observations	Mean in No-Conflict	SE No-conflict	Mean in Conflict	SE Conflict	*p-value*
Firm Size						
Export, Jan+Feb 2007, in Kg '000	114	90.60	11.20	104.67	15.65	0.48
Number of Workers Jan 2008	79	480.83	103.82	456.45	45.18	0.81
Land (Ha)	79	44.93	9.10	98.61	63.74	0.47
Firm History & Ownership						
Year Firm Created	79	1997	1.03	1998	0.81	0.66
Foreign Owner	114	0.34	0.06	0.42	0.06	0.37
Indian Owner	114	0.22	0.06	0.21	0.05	0.87
Kenyan Owner	114	0.36	0.06	0.32	0.06	0.61
Politically Connected Firm	114	0.26	0.06	0.20	0.05	0.42
Firm Labor Force						
% of Female Workers	79	61.28	2.10	62.53	2.63	0.73
% of Temporary Workers	79	15.86	4.11	20.66	4.12	0.43
% of Workers with Primary Education	79	36.73	5.43	49.31	5.54	0.11
% of Workers with Secondary Education	79	52.08	4.99	41.08	4.89	0.12
% of Workers Housed	79	11.20	3.57	11.21	3.14	1.00
Firm Certification & Standards						
KFC Member	79	0.63	0.09	0.52	0.08	0.35
Fair Trade Certification	79	0.30	0.09	0.32	0.07	0.87
Max Havelaar Switzerland Certification	79	0.20	0.07	0.18	0.06	0.85
Milieu Programma Sierteelt (MPS) Certification	79	0.40	0.09	0.50	0.08	0.40
Firm Products & Marketing						
% Exports to Auctions	114	49.95	4.65	50.74	4.50	0.90
Dummy for Exports to Direct Buyers Only	114	0.20	0.06	0.22	0.05	0.87
% Production in Roses	114	0.67	0.06	0.61	0.06	0.41
Number of Insulated Trucks	79	1.40	0.22	1.11	0.25	0.39

Notes: ***, **, * means statistical significance at the 1, 5 and 10 %-level respectively. The Table tests differences in sample-means for several characteristics for firms in the regions affected by the conflict and firms in regions unaffected by the conflict. Information on Firm Labor Force, Firm Certification & Standards, Number of Insulated Trucks, Year Firm Created, Number of Workers and Hectares of Land comes from an orignal survey conducted by the authors. Exports in the first two months of 2007 (in '000 Kgs), % Production in Roses, % Exports to Auctions, Export to Direct Buyers Only come from offical trade statistics (Source: HCDA). Information on data collected on Firm Ownership and Political Connectedness is described in the Data Appendix.

Table A2: Placebo Unit Weight -Within Firm Results

Dependent Variable = unit weight (of a single stem in kgs of firm *f* to buyer *b* on day *d*)

	(1)	(2)	(3)
Days of violence * conflict location	-0.0008	-0.001	-0.001
	(0.0005)	(0.0006)	(0.0006)
Days of violence * conflict location * direct exports	-0.0004		
	(0.0008)		
FIXED EFFECTS			
day of the week * conflict location	Yes	Yes	Yes
week * conflict	Yes	Yes	Yes
direct-week	Yes	No	No
relationship	Yes	Yes	Yes
SAMPLE			
Excluding 4 largest firms	Yes	Yes	Yes
Only firms selling to Direct Buyers	No	Yes	Yes
Observations (firm-transaction)	12859	8307	7950
No. of Relationships	300	233	170
No. of Firms	72	49	45

Notes: ***, **, * means statistical significance at the 1, 5, 10 %-level respectively. Standard errors are clustered at the buyer-week and relationship level and reported in parenthesis. Days of violence are 30th December 2007 to the 3rd January 2008 and 25th January 2008 to 30th January 2008. The sample period covers the twenty weeks from 20th October 2007 to the 9nd of March 2008. Day of the week dummies are Mondays, Tuesdays, .. Sundays. Direct exports is a dummy that takes value equal to one if the flowers are not exported to an auction house. The sample of firms includes the established producers and excludes traders of flowers as well as the four largest firms. (Source: HCDA, Origanl firm-level survey, see Data Appendix for other variables). Column (3) is on the sub-sample whereby within a relationships there has been more than 4 transactions in the first 10 weeks of the sample period.

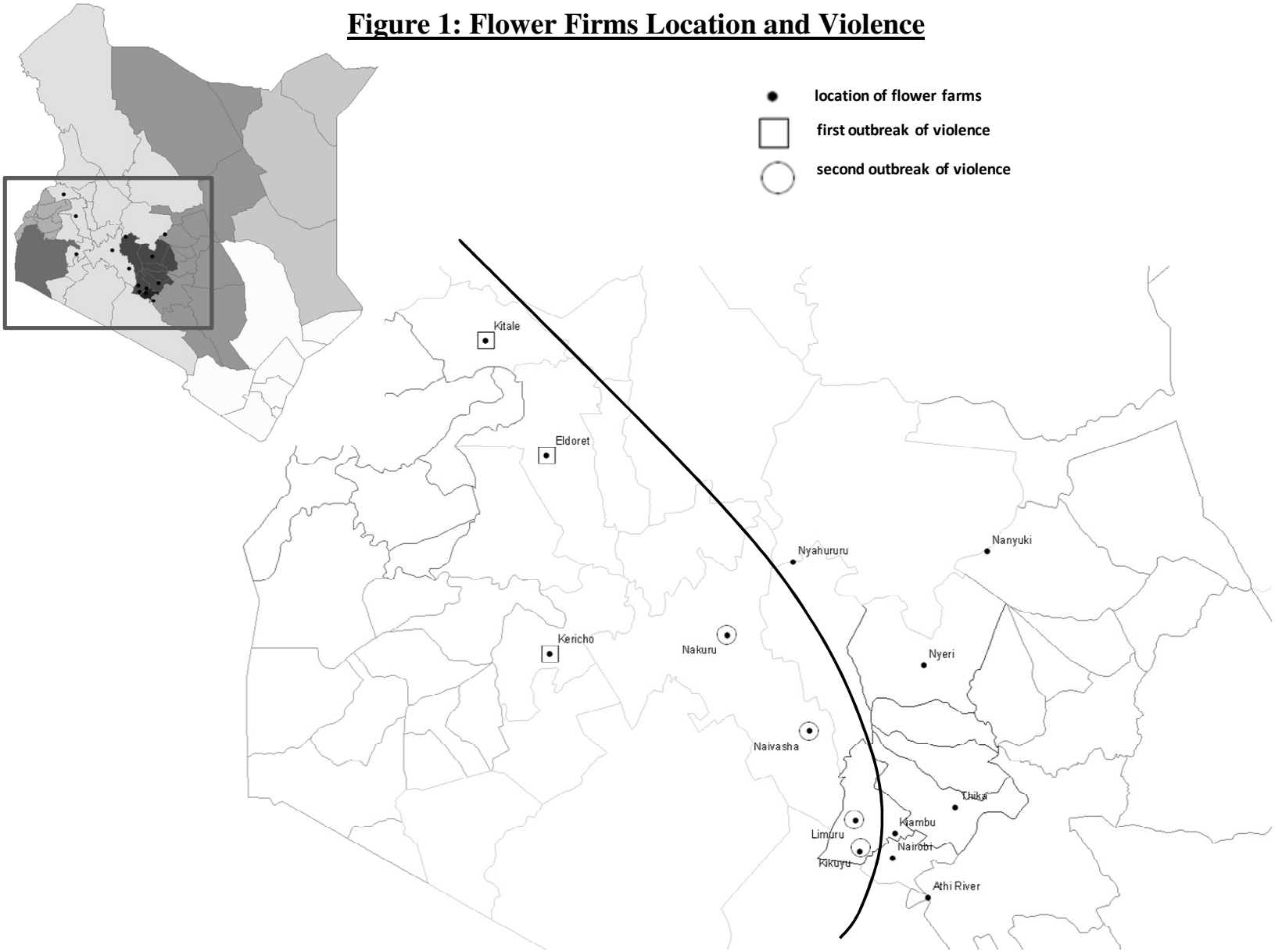
Table A3: Marketing Channels - Firm Heterogeneity

Dependent Variable = Log (1 + daily export's in kgs of firm *f* to buyer *b* on day *d*)

	(1)	(2)	(4)
Days of violence	-0.325***	-0.231	-0.437***
	(0.108)	(0.144)	(0.123)
FIXED EFFECTS			
day of the week	Yes	Yes	Yes
week	Yes	Yes	Yes
relationship	Yes	Yes	Yes
SAMPLE:			
Only Direct Relationships in	**All Firms**	**Mixed Firms**	**Only Direct Firms**
More than 4 transactions in the first 10 weeks of the Sample Period	Yes	Yes	Yes
Observations (firm-transaction)	21076	11428	9648
No. of Relationships	171	92	79
Adj R-sqrd	0.391	0.240	0.476

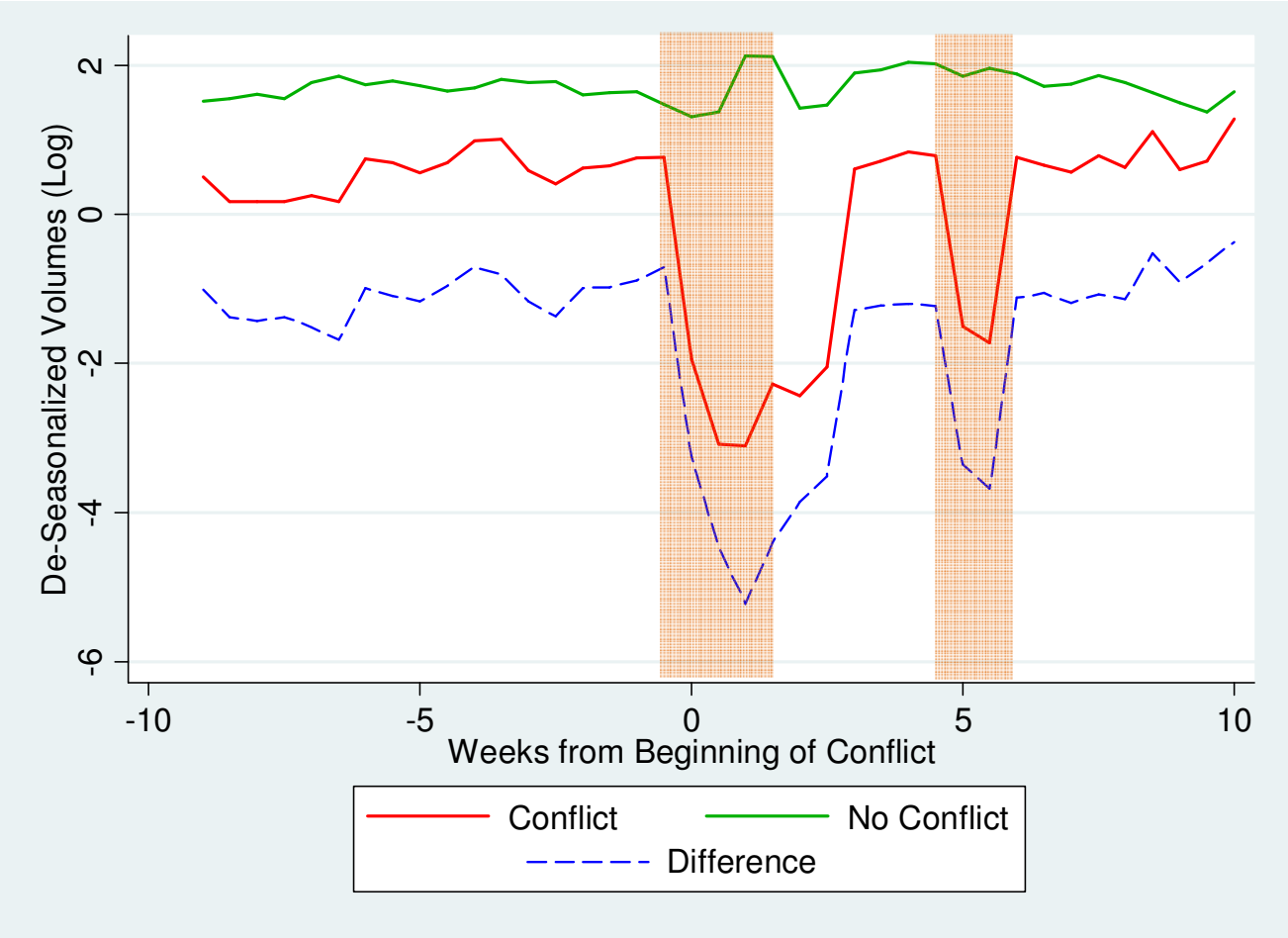
Notes: ***, **, * means statistical significance at the 1, 5, 10 %-level respectively. Standard errors are clustered at the buyer-week and relationship level and reported in parenthesis. Days of violence are 27th December 2007 to the 3rd January 2008 and 25th January 2008 to 30th January 2008. The sample period covers the twenty weeks from 20th October 2007 to the 9th of March 2008. Day of the week dummies are Mondays, Tuesdays, .. Sundays. The sample of firms includes the established producers and excludes traders of flowers as well as the four largest firms. (Source: HCDA, Origanl firm-level survey, see Data Appendix for other variables).

Figure 1: Flower Firms Location and Violence



Notes: For illustration purposes only the figure displays the geographical distribution of the nearest towns to the flower farms as well as whether the relevant locations had been involved in the first or second outburst of violence.

Figure 2: Effect of Violence on Export Volumes [Difference in Difference]



Notes: The figure shows the time series of volume exported of firms in *conflict* and in *non-conflict* locations for each week for the 10 weeks prior and 10 weeks post the outbreak of violence. For details of classification of firms and location of conflict refer to Ksoll et al (2009). The highlighted orange regions in the figure depict the weeks of violence, whereby Week 1 of 2008 is from the 29th December 2007 to 4th January 2008 inclusive, the following weeks are defined accordingly. The sample of firms includes established producers and the four largest firms and excludes traders of flowers.

Figure 3A: Average Price per Stem of a Rose

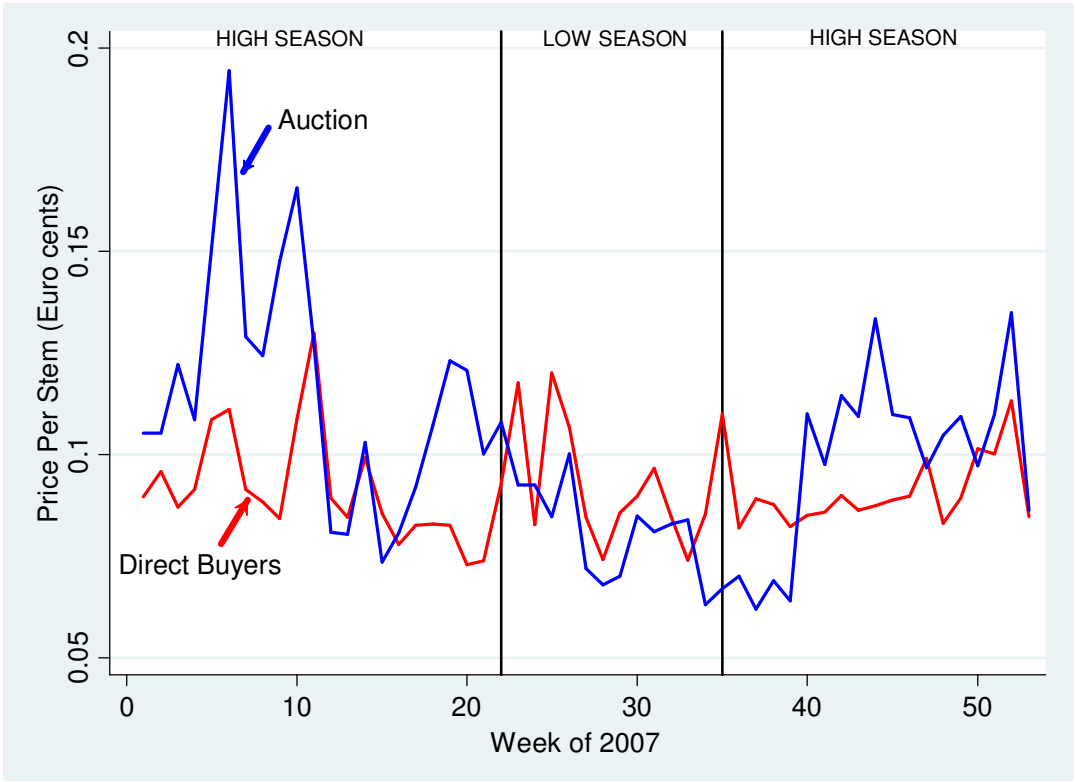
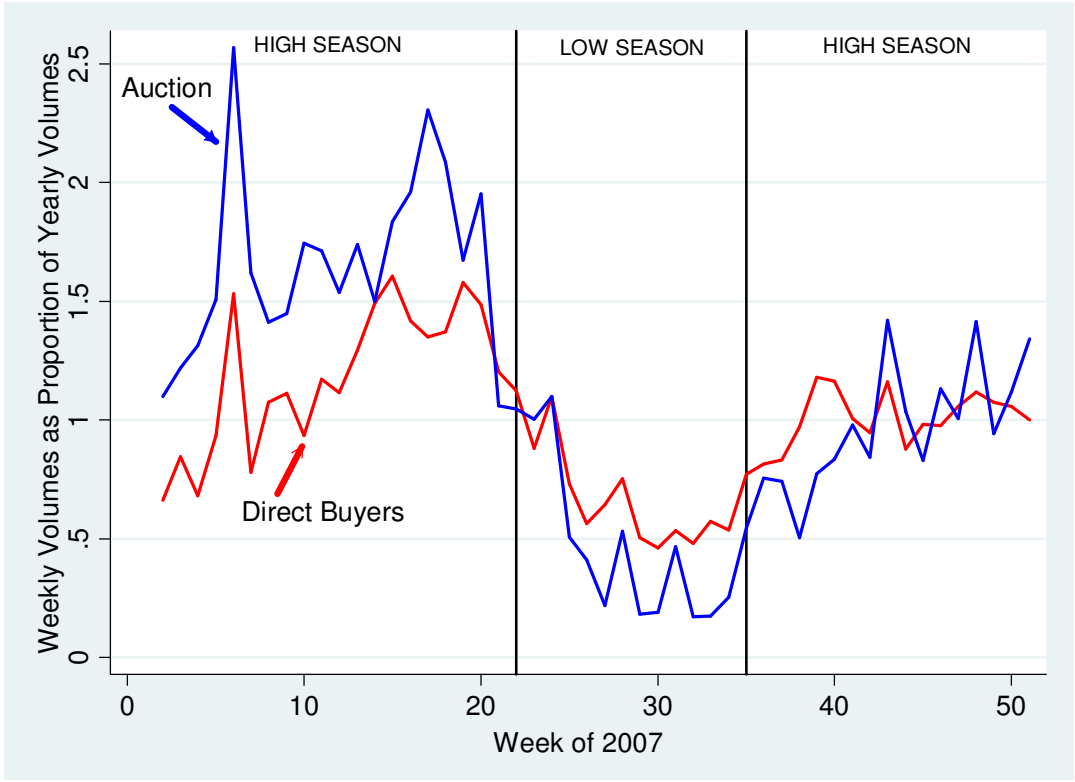
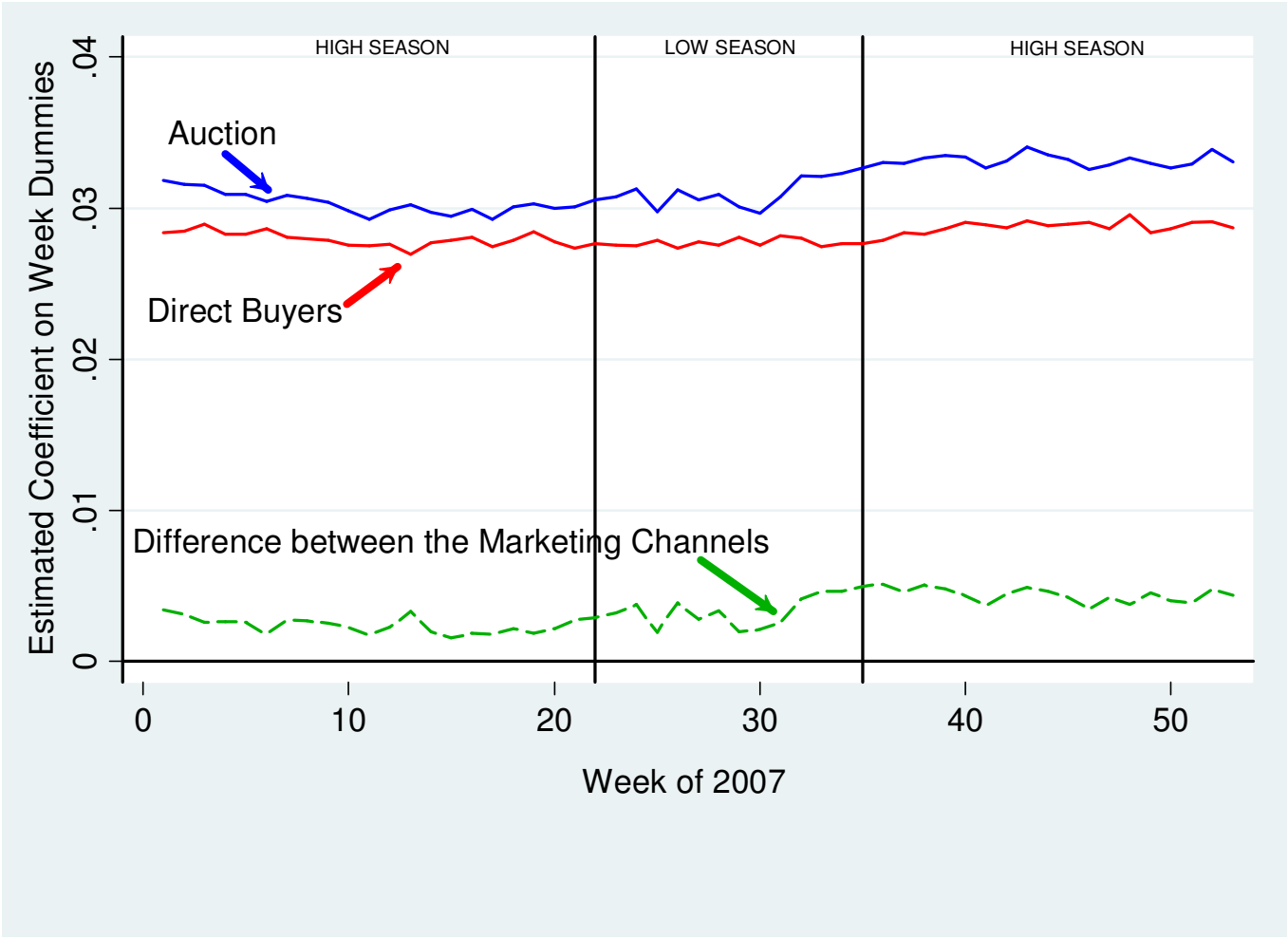


Figure 3B: Volume Supplied across Marketing Channels



Notes: Figure 3A illustrates in the time series evolution of the price per stem of an average rose exported through Direct Buyers and through the Dutch Auctions. The "Auction" price series depicts the weighted price according to volume traded at all the Dutch Auctions and is the Freight-on-Board price. The weekly price per stem to the Direct Buyers is obtained from the transaction level dataset for those relationships which are involved in roses in the year 2007. Figure 3B is the Volume of Stems exported through Direct buyers and through the Auctions as a percentage of its respectively yearly average. (Source: International Trade Centre, UNCTAD/WTO and HCDA).

Figure 4: Stem Weight on Different Marketing Channels – Within Firm Evidence

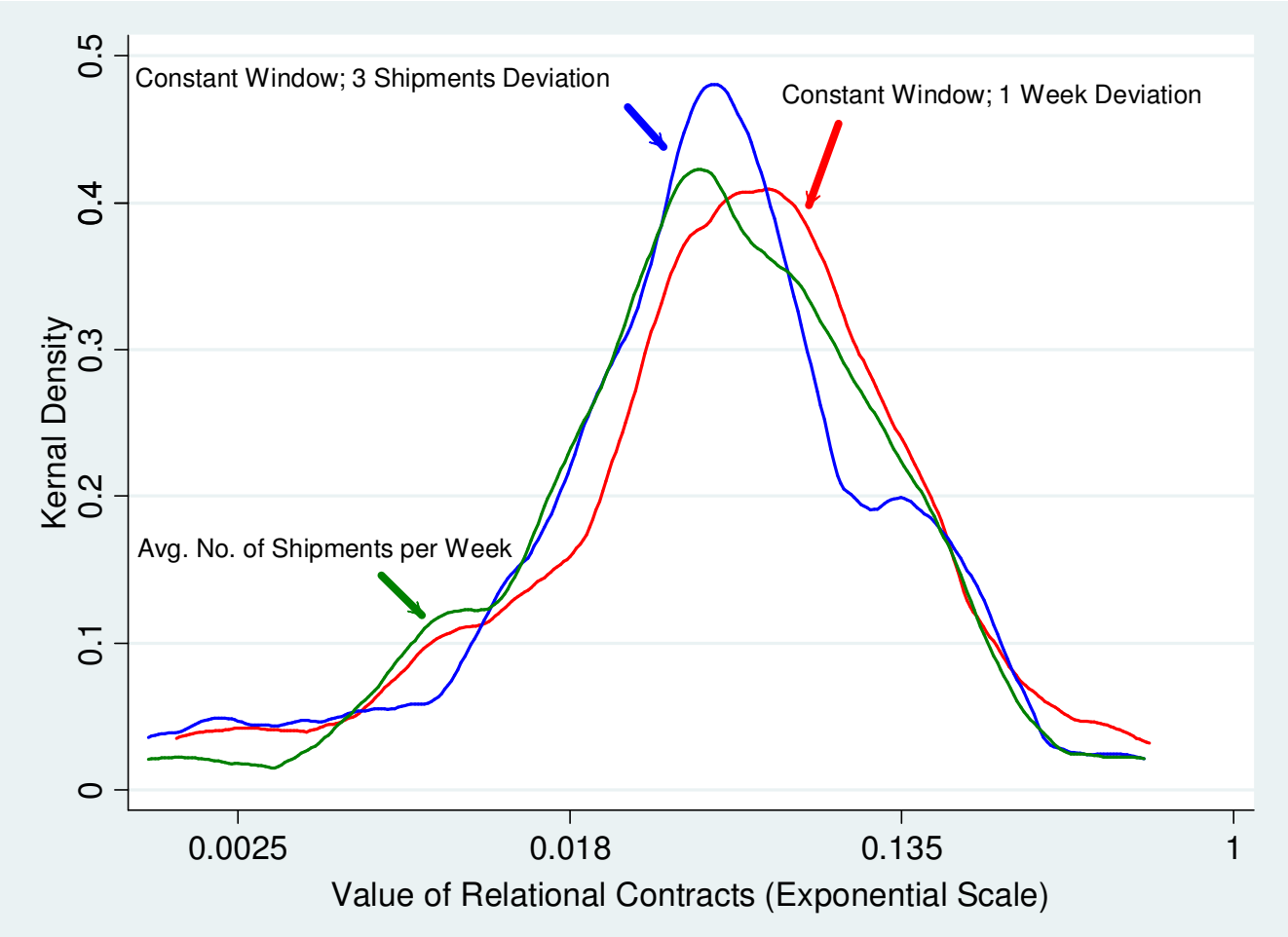


Notes: The series "Auction" and "Direct Buyers" graphs the coefficients of the weekly dummies from a regression where the dependent variable is the weight (in kgs) of a single stem of rose on week dummies, week dummies interacted with the marketing channel, firm fixed effects with the standard errors clustered at the relationship level. Sample period is the full calendar year 2007. (Source: HCDA).

Figure 5: Predicting Future Shipments

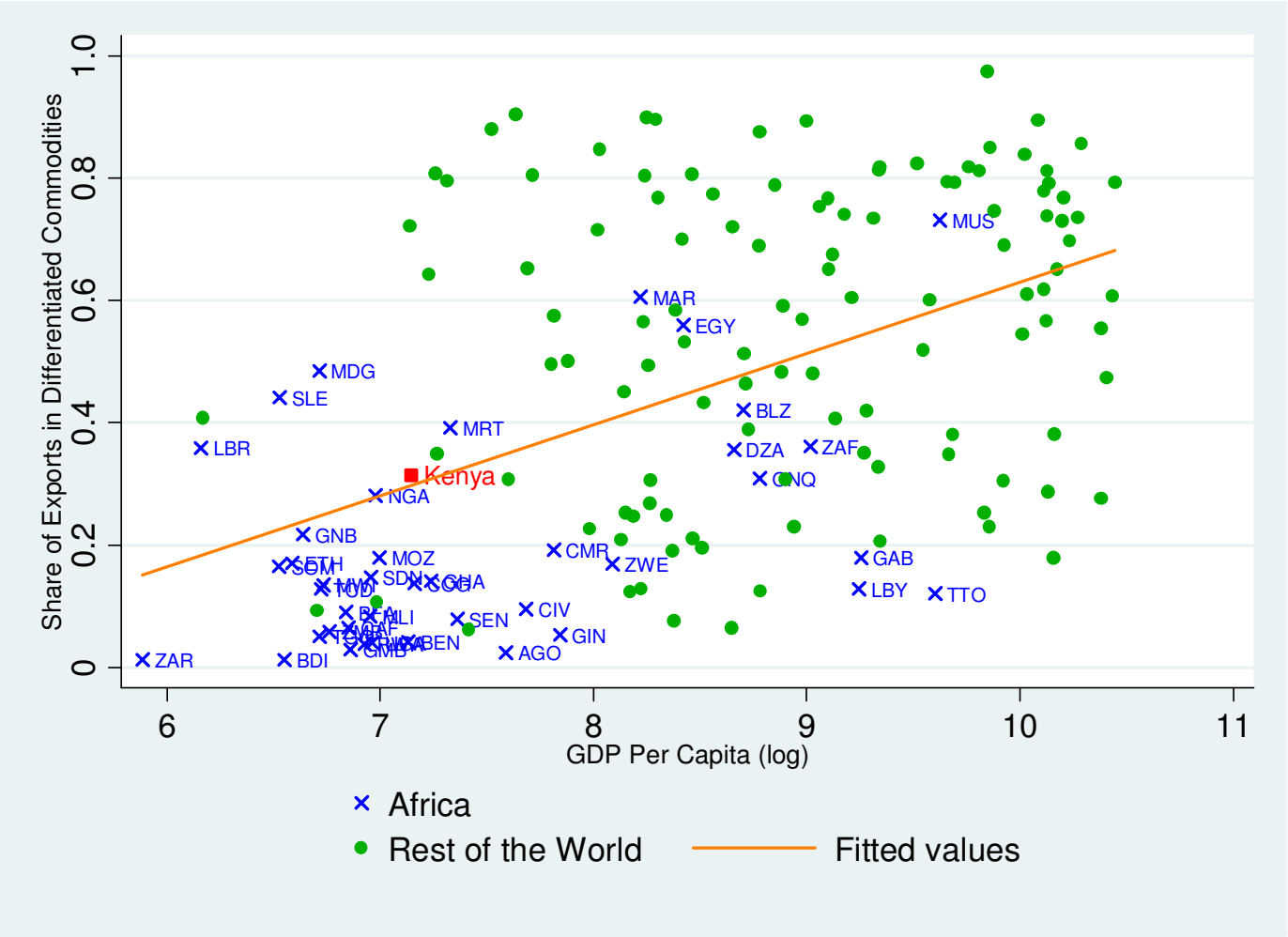
Notes: For each relationship active in the season 2006-2007, the figure shows the average number of shipments per week in the first 10 weeks of 2007 as a function of the average shipments per week in the last 10 weeks of 2006.

Figure 6: Estimating the Value of Relational Contracts



Notes: The figure shows kernel density estimates of the Value of Relational Contracts as derived from equation (10). The *x-axis* is on the exponential scale. Tabulation below shows correlations across different estimates of the *Value of Relational Contract* for those relationships were transactions exceeded 24 (out of the 53 weeks of the year 2007) and there were more than 2 shipments per week.

Figure 7: Structural Transformation and Marketing Channels in Export Markets



Notes: The figure plots the share of the value of a country exports in commodities that are exported through direct relationships against per capita GDP in 2000. (Source: Penn Tables, UN World Tables, Rauch (1999) Commodity Classification and Author's calculations).