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Amirah El-Haddad,Department of Economics,Faculty of Economics and Political Science, Cairo University
Email: amirah.elhaddad@gmail.com

Abstract

Empirical analysis of vertical integration has mostly been restricted to developed countries. But since the institutional context in developing countries is very different, so may be the factors that influence vertical integration. Estimates made using a new data set of Egyptian garment firms show that distinctive features of the business environment are indeed the most significant determinant of vertical integration. Limited access to finance restricts the possibilities for many firms to undertake the investment required to integrate, whilst volatile and uncertain market conditions make firms more likely to rely on the market for their inputs. This does not mean that transaction cost theories of vertical integration are irrelevant; for example, high monitoring costs discourage integration while disputes over quality and temporal specificities encourage it. But there are nuances related to market segment. Producers of higher quality garments rely on imported textiles. Contrary to theoretical predictions, these producers do not integrate even if search and switch costs are high, but the opposite is true of producers relying on domestic suppliers.

ملخص

ظل التحليل التجريبي للتكامل الرأسي مقصورا، في أغلبه، على الدول المتقدمة، ولكن نظرا للاختلاف الكبير في السياق المؤسساتي للدول النامية فقد نجد اختلافا مماثلا بالنسبة للعوامل المؤثرة على التكامل الرأسي.

وقد أظهرت التقديرات التي تم الخلوص إليها باستخدام نظام بيانات جديد لشركات الملابس المصرية أن الخصائص المميزة لبيئة العمل هي، في الواقع، أهم محددات التكامل الرأسي.

يقيد التمويل المحدود قدرات العديد من الشركات على تقديم الاستثمارات اللازمة للتكامل، بينما تدفع ظروف السوق المتقلبة والتي لا يستقر لها قرار تدفع الشركات إلى الاعتماد بشكل أكبر على السوق في الحصول على مستلزمات الإنتاج. وهذا لا يعنى أن نظريات تكلفة العمليات الخاصة بالتكامل الرأسي لا تنطبق على تلك الحالة ؛ فعلى سبيل المثال، تعوق تكلفة الرقابة المرتفعة هذا التكامل، بينما تنشطه الخلافات حول الجودة والخصائص المؤقتة.

وهناك فروق طفيفة حسب الشريحة التسويقية، فمنتجو الملابس ذات الجودة العالية يعتمدون على الأنسجة المستوردة. وعلى عكس التوقعات النظرية، نجد هؤلاء المنتجين لا يتكاملون حتى لو كانت تكلفة البحث والنقل مرتفعة بينما نجد أن العكس هو الصحيح بالنسبة للمنتجين الذين يعتمدون على الموردين المحليين.

Introduction

In the simplest presentations of neo-classical economics, firms can buy their inputs from a competitive market through costless transactions. However, the New Institutional Economics (NIE) argues that transaction costs may be sufficiently high for firms to decide to make, rather than buy, their inputs. Vertical integration, that is combining two or more stages of a production process under one firm, is a key organizational structure that moderates these costs (Arrow 1975, Alchian et. al 1978, Willamson 1979, and Joskow 1985).

The literature has focused on conditions that encourage vertical integration in developed economies, but given less attention to conditions that may constrain vertical integration or to conditions more likely (but not necessarily exclusively) to be found in developing countries.

This paper empirically examines both motivations toward, and constraints on, backward vertical integration of garment producing firms in Egypt into fabric production. Using survey data and a model drawing on existing theory, it analyses how economic and institutional constraints shape the incentive system and feed back into firms' choice of governance structure.

Survey Data: The Textile Industry in Egypt

From the 1930s through the 1980s, the textile and garment industry in Egypt was both protected by trade barriers and largely controlled by the public sector. This resulted in the large domestic market being served by largely uncompetitive industries with little regard for quality. The 1990s brought about several changes. Economic liberalization paved the way for expansion of a privately owned garment sector, though not in fabrics, which largely remained in government hands. Liberalization and increased media access exposed middle class Egyptian consumers to rapidly changing Western fashions, increasing the quality demands they made on Egyptian firms. At the same time, Egypt's traditional export destinations in the Eastern European Block collapsed, causing exporters to look elsewhere, that is, to more demanding Western markets.

These changes created a quality gap. The quality of fabric input required by the higher segment of the garment industry could not be satisfied by the domestic fabrics industry. In addition, the uncompetitive traditional fabric industries could not comply with the timely delivery required by firms producing for export to markets with four or more fashion seasons each year. In this paper, input quality has been measured in three ways: the existence of disputes over quality with the firm's repeat fabric suppliers, the availability of the desired fabric quality and the percentage of garments exported as a percentage of total sales.

The need to ensure input quality induced the desire for vertical integration in the garment industry. This was especially so for firms serving the (high end of the) domestic market, since they were legally banned from importing their fabric inputs. But while some firms have managed to integrate, others have not.

To isolate factors underlying this difference, A 2004 sample frame of 2,500 private textile firms (compiled by the Federation of Egyptian Industries) was reduced to 1,418 firms by verification through a telephone pre-survey. Nearly 95 percent of the garment firms were concentrated in nine of the country's 27 governorates. The incidence of vertical integration was limited (only 25% were vertically integrated).

Therefore, firms were divided into two groups, with all vertically integrated firms in one group and a random sample of unintegrated firms in the other (cf. Maddala, 1992), requiring the use of sample weighting in later analysis.[1] This selection resulted in a final sample of 257 firms, distributed across all nine of the governorates in which garment industries are located.

The survey was conducted through face-to-face interviews, March-June, 2004. The interviewees were either owners or senior managers (which mostly coincide), so if not the decision-maker, then someone close to the decision making process. Different questionnaires were used, depending upon whether the firm (1) was vertically integrated into fabrics and/or retail at the outset, (2) integrated later, or (3) were unintegrated[2].

The questionnaires were designed to elicit information about factors either considered important by the existing vertical integration literature, or identified in pre-survey interviews[3] as potentially important, to test the applicability of a number of theories about vertical integration. For example, questions were included that allowed the exploration of agency theory including team agency (Alchian and Demsetz, 1972) and measurement costs (Holmstrom and Milgrom, 1994 and Holmstrom, 1999), generally testing the relationship between monitoring costs and vertical integration; and considering risk avoidance, testing both the risk adjusted property rights theory (Hanson, 1995) and demand variability theories (cf. Lieberman 1991) (e.g. Carlton 1979, Chandler 1977, Porter 1980, Blair & Kaserman. 1983, Harrigan 1983) measured by demand variability and uncertainty just preceding vertical integration .

In addition, questions were included to test lock in and potential hold up considerations[4] addressed by a range of transaction cost theories (e.g. Williamson: 1979, 1985; Masten et al.1991) and a variant of the modern property rights theory (Grossman and Hart 1986, Hart 1986, Hart & Moore 1990) similar to those adopted by Woodruff (2002) and Hanson (1995). Measures included search and switch costs, social and moral costs, temporal specificity and fashion turnover rate.

Other factors were identified from preliminary pre-survey interviews and seem to be either specific to Egypt or to developing countries more generally or to function differently there. Financial constraints[5] and credit market imperfections as determinants have been rather neglected by theories of vertical integration. Limited access to finance is likely to be more severe than in developed countries. Though, informal credit[6] is more likely to have a role, and may in some situations adequately substitute for formal credit. Measures incorporated how costly it would be to establish a fabrics unit.

1More information on this random selection and on disproportionate sampling is available from the author upon request.

2 More detail on questionnaire design is available from the author upon request.

3Intensive pre-survey interviews were carried out through November-December 2002.

4‘Lock in’ is a situation in which competitive situations between buyers and sellers are transformed into monopsonistic or monopolistic ones. ‘Hold up’ hence refers to either buyers behaving opportunistically to exploit their monopsonistic powers or sellers behaving opportunistically to exploit their monopolistic powers.

5 Financial constraints would be a lack of own funds combined with no access to credit.

6 The role of informal credit in developing countries has been stressed in McMillan and Woodruff (1999).

Another factor not stressed in the vertical integration literature is horizontal firm size: the higher the fixed investment cost involved in any additional vertical stage of production, the more important the scale of operations prior to integration. This can be measured through proxies such as garment sales and issued capital. Furthermore, because many essential institutions, such as well-functioning legal systems and equity, stock and insurance markets are usually missing or malfunctioning in developing countries, individuals rely upon institutional substitutes to overcome this deficiency. These could be possession of power, access to foreign institutions, and access to social networks (Macaulay 1963, Haley 1997, Greif 1997, McMillan 1997, McMillan and Woodruff 1999). These institutional substitutes are proxied by three variables in the questionnaires: membership to the Egyptian garment commodity council, having a company lawyer, and percentage of foreign ownership.

Other, control, variables include whether the firm was listed on the stock market before integration, the extent to which it was believed that integrating could reduce a firm's tax burden, the firm's age, whether it is a family business, and finally the percentage of fabrics provided by a sister company or a branch.[7]

Model and Estimation:

The survey data were then fitted to a simple model with two advantages over vertical integration (VI) models in the current literature (which can suffer from possible sources of bias). First, VI is usually modeled as a function of the current values of the right-hand side (RHS) variables, but many of these may be endogenous. Second, studies focus on the variable of interest and so suffer from omitted variable bias. The model used here overcomes the first problem by using lagged values of the determinants. This makes theoretical sense, as it is the value of explanatory variables at the time the decision to integrate was made which matter. The second problem is addressed since all competing determinants are fitted to a single equation.

In most empirical studies, vertical integration is measured as a dichotomous variable: taking a value of 1 if the share of inputs produced internally rather than purchased exceeds some threshold.[8] For example, Woodruff (2002) sets VI at 1 if the manufacturer sells any portion of production through owned stores, and Montverde and Teece (1982) do so if the firm produced 80 percent or more of a component internally. A continuous variable was suggested instead in a review of the empirical literature (Joskow 1988). Based on the above, the estimated model takes the following form:

$$VI_t = VI_t(X_{t-i}; \varepsilon_t) \qquad (1)$$

in which VI_t is the dependent variable, a fractional response variable: the fraction of fabrics produced internally to the value of the firm's total fabric requirements during

7 A selection of the survey questions appears in Annex 1. Descriptive statistics and predicted signs of independent variables appear in Annex 2.

8This applies in the case of backward integration, which is what is analyzed here. An analogous formulation applies for forward integration. Exceptions are Wernerfelt, (1997) who treated the dependent variable as continuous, and Hubbard (2000) who used a categorical dependent variable. In contrast, the literature on franchising, which is a closely related literature to that on VI, has abandoned the use of dichotomous variables. The literature on chain franchising uses the percentage of units franchised (as opposed to company-owned) as its dependent variable (e.g. Lafontaine, 1992).

the last completed financial year't';[9] X_{t-i} is a vector of the level of the independent variables for the year(s) preceding the vertical integration decision, and by definition, exogenous since it is pre-determined[10]; and ε_t is the error term of the population regression line.

Close to half of all vertically integrated firms are fully vertically integrated (i.e. no longer deal with the upstream market), in which case the dependent variable would take the value of 1. For the remaining firms (i.e. those for which 0<VI<1), the fraction varies between .05 and .97. The median, which is also approximately the mean, is 0.54.

Following Papke & Wooldridge (1996), the conditional distribution of the dependent variable (VI) on the independent variables (X), E(VI|X)=G(.), is estimated by assuming a logistic distribution, that is, $G(.)= (e^{Xb}/1+ e^{Xb})$, which is then estimated by maximum likelihood (MLE).

Results:

Maximum likelihood estimations are given in Table 1. The results of a basic regression containing the main determinants discussed above are given as regression 1 and robustness checks as regressions (2-8) in Table 1.

Table 2 calculates the marginal effects using the coefficients from the basic regression both at the means (which gives a fitted value of VI=0.01), and at a level for the independent variables which gives a fitted value of the fraction integrated of around 0.5 (i.e. VI=50%). It shows marginal effects for a one standard deviation increase around the specified values of the regressors (either the mean[11] or the value selected to yield a fitted VI of 0.56). The table also ranks the basic regression variables according to importance.

More nuanced hypothesis are explored later in the paper, using later discussion together with the results presented in Table 3.

Discussion:

The data in Table 1 was used to derive Table 2 –see footnote 11. In this study, market volatility (measured by demand variability – see Table 2) holds first place in terms of importance, followed by firm size and then by financial constraints. The strong influence of these variables is to be expected in an environment such as Egypt, where risk-spreading channels are imperfect or absent and where financial intermediaries

9The question was asked separately for garments serving the domestic market, and those serving the export market. The dependent variable is the weighted average of these shares.

10 Cognitive concerns relate to respondent recall, as well as to 'time problems', that is, the appropriate choice of time period for dependent and independent variables, the author ran the same regressions for a sub-sample of firms whose respondent was the decision maker (as opposed to the respondent's offspring for instance) at the time of integration and results have been robust. In addition, concerns of past perception variables (as opposed to characteristics variables whose values were given out from the firm's books) being contaminated by current perceptions (and so pave the way again for endogeneity) have been addressed by regressions showing the correlation coefficient between the two to be negligible. Detailed analysis for these and other caveats are available from the author upon request.

11 The marginal values given by STATA are for a one unit change around the mean for continuous variables, and a change from 0 to 1 for the two dummy variables. These marginal changes have been multiplied by the respective standard deviation for each variable to derive the figures given in Table 2.

function poorly. Calculated at expected VI=0.5[12] a one standard deviation increase in demand variability (a proxy for risk avoidance) reduces vertical integration by 34%; a one standard deviation increase in sales uncertainty (another proxy for risk avoidance) reduces integration by 15%. Other studies (e.g. Hanson 1995, Anderson & Schmittlein 1984) have also found that exposure to natural risk (proxied by sales uncertainty) discourages vertical integration. This confirms that a higher degree of exposure to "natural risk" to the buyer reduces the likelihood for backward integration. "Natural riks"is risk arising from variance in the state of the nature. Were the buyer (i.e. the downstream firm which is the garment firm here) to be facing uncertainty in the production environment (e.g. sales uncertainty), it would want to spread that risk by asset ownership spreading and so by relying on the market, rather than integrating.

Firm size has been used in some studies as control variable. For example, Anderson and Schmittlein (1984) found that size is a significant determinant of the adoption of direct sales force (integration) as opposed to the use of a manufacturer's representative (i.e. using the market). In this study, both variables are not just significant but among the most important (2nd and 3rd). A one standard deviation increase in the horizontal size of the firm, proxied by issued capital (logged), increased in-house production by 32%. This factor is not stressed in the vertical integration literature but had become evident as a potential factor during pre-survey fieldwork. In essence, this is a standard economies of scale argument: the larger the scale of operations preceding integration the more cost effective vertical integration can be.[13]

A one standard deviation increase in financial constraints, measured as the investment cost of opening up a fabric production unit, cut vertical integration by 31%. Financial constraints to vertical integration have been neglected by both the theoretical and empirical vertical integration literature.

Firms that obtain their fabrics from sister companies, branches or both are less likely to be integrated: a one standard deviation increase in the percentage of fabric inputs provided by a branch or sister company reduces the share procured internally by 25%.[14,15]

A history of quality disputes with the firm's repeat fabric suppliers does, as expected, increase the likelihood of vertical integration: a one standard deviation increase in disputes over quality results in a 12 percent increase in the degree of integration.[16] There are no directly comparable results in the existing literature. The importance of the quality disputes variable is twofold. First, it reveals the importance of the market segment to which the garment firm belongs. If the firm serves the high end of the

12 More discussion on the interpretation of coefficients is available from the author upon request.

13 Firm size could also proxy financial constraints.

14 By definition, if a firm obtains some of its total input requirements from a branch/sister company it reduces the volume of those inputs it produces internally.

15 A sister company is a company owned by some or all of the same owners of the interviewed company but not registered under the same name.

16 An ordered categorical response variable (of n categories) may enter the regression in two ways: (1) as a single categorical variable, that is treating it as if it were a continuous variable or (2) as n-1 dummy variables corresponding to all but one of the n categories. The former is a restricted version of the latter, as it assumes equal increments between categories. This restriction was tested for all categorical variables in the model using a log-likelihood ratio test. In all cases the restricted model was accepted. These results are available from the author on request.

market, especially given the inefficiencies of the supporting fabric industry, product quality considerations are essential. Second, a wide range of dispute resolution mechanisms in Egypt may be flawed.[17] As opposed to the quality disputes variable presented here, the literature has considered product idiosyncrasy and complexity, which have been associated with relationship specific investments (i.e. lock in and hold up considerations).

In this model, lock in and potential hold up are measured by variables capturing temporal specificity[18] and social costs, the latter not yet figuring in the literature.[19] Both variables are significant with the expected signs, with a one standard deviation increase increasing the share of inputs produced internally by either 18% in the case of temporal specificity, or 12% in the case of social costs. This finding is in line with other studies examining the impact of temporal specificity (Masten 1984, and Hubbard 1999. Like the quality dispute variable, temporal specificity reflects the importance of market segment. Firms serving segments for which timely delivery is essential are more likely to integrate. In the vertical integration literature, the problem of temporal specificity is generally viewed as a hold-up problem, whereby the supplier may exploit the producer's need for timely delivery of supplies to improve contract conditions (i.e. opportunistic behavior). However, the questionnaire revealed only the importance of timely delivery and did not distinguish whether untimely delivery was associated with opportunistic behavior or with supplier's inability to deliver on time due to circumstances beyond its control.

The inability to deliver on time is, like poor quality, sometimes divorced from opportunistic behavior but associated with the problems of production in a developing country. For instance, during one of the pre-survey interviews, the electricity went off 4 times during the 3 hour appointment (for a total period of 1 hour). The respondent explained that he cannot be harsh on his supplier when it comes to timely delivery: 'see how often we lose electricity? If this happens to him frequently, even if he is a man of his word he cannot fulfill on time. It is simply out of his control.'[20] This factory, and others like it, would be in line with Fafchamps's (1996: 61) argument that 'delivery problems are blamed on shocks affecting suppliers and are treated by respondents as cases of excusable default'.

In social network settings, the social and moral costs involved in replacing suppliers with whom one has personal or family ties with can be so high so as to restrain economic agents from attaining efficiency. By restricting their ability to switch to alternative suppliers, these costs operate by limiting the economic agents' choice set. This is consistent with Uzzi's argument that embeddedness (the process by which social relations shape economic actions) yields positive returns only up to a threshold point, after which it becomes negative (Uzzi, 1996). Had there been no effect of social and moral costs on vertical integration, this result would have implied the persistence of personalized exchange. One would not have been able to infer, however, that the

17 The range of dispute resolution mechanisms has been examined in El-Haddad (forthcoming) for Egypt, Hendley et al. (2000) for Russia, and Hendley and Murrell (2003) for Romania.

18 A third measure of lock-in, related to search and switch costs, was insignificant in the basic model, but becomes significant when variations by market-orientation are allowed (see below).

19 Work in sociology focuses on social relations. For instance, Uzzi's work has put a very large weight on the effect of social relations on economic actions and outcomes in general (but not in the context of vertical integration) (Uzzi 1996; 1999)

20 Interview with Waleed Abdo, Cairo, Egypt (2 December 2002). Respondents' names have been changed to ensure confidentiality.

persistence of this type of exchange is efficient.[21] The results indicate that garment firms in Egypt react to these types of costs by vertically integrating which can be interpreted as a move toward efficiency.[22]

Five sets of variables act as constraints on vertical integration: financial constraints, limited firm size, desire to avoid risk, having a sister company or branch and monitoring costs. All have the expected sign. The first four have been discussed above. With respect to monitoring costs, a one standard deviation increase in costs reduces integration by 9%. Monitoring costs refer to the costs associated with the effort to single out workers' productivity and to measure accurately their contribution to output. A more general definition of horizontal (vertical) monitoring costs are the administrative and managerial costs of (associated with) coordinating the different stages of production) ensuring that quality is adequate, that technical specifications are met and that production is on time: accomplished through matching productivities to inputs and so punishing and rewarding accordingly.

Monitoring costs are higher in fabric production, which involves a higher level of team production than garment production does. Weaving and knitting entail team production and joint use of equipment.[23] In contract, garment production involves a 1:1 sewing machine to worker ratio. In team agency, the problem is the difficulty of singling out each agent's productivity from that of the other agents.

The larger these costs, the less likely firms are to integrate. Indeed, vertically integrated firms devise sophisticated production tracking systems to enable them to monitor their workers. Several of the interviewees have indicated the hardship of monitoring workers in just one vertical stage of production, let alone adding and monitoring another stage.[24] Several studies have looked at monitoring costs as a determinant of forward integration with reference to costs of organizing the sales force. Using this variable in an agency framework, both Holmstorm & Milgrom (1991, 1994) and Anderson & Schmittlein (1984) found that higher monitoring costs provided a disincentive for integration. Such costs were seen as insignificant by Wernerfelt (1997).

Not all variables in the basic regression model are significant. Asset specificity (measured by the fashion turnover rate) has a p-value of 0.50. This is somewhat surprising, since asset specificity has widespread support[25] as an important factor in developed economies. For example, Montverde and Teece (1982) examined 'human asset specificity' in the automobile industry and concluded that the larger the engineering effort required to design a specific automobile part (their measure of human asset specificity) the more likely is this part to be internally produced rather than contracted out. The same finding was reported in Masten's (1984) study of an aerospace firm: the larger the degree of design specificity (or site specificity) of a component, the more likely the component will be produced internally.

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21 Kranton (1996) shows that personalized exchange can persist even when it is inefficient.

22 Kranton has also shown that the market (or generally any organizational structure) can persist even when it is inefficient (Kranton, 1996). But it is reasonable to assume that the transformation from complete personal exchange to either complete or partial integration is at the onset and so the dynamics of reaching the other extreme of vertical integration being inefficient are, at this point, still far reaching.

23 Interview material shows that a factory of 1,500 workers may have 500 sewing machines but only 4 knitting machines (Ahmed Ali, November 2002).

24e.g. Waleed Abdo (November 2002).

25 For reviews of the literature see Joskow 1988, Shelanski et al. 1995, and Klein 2004.

Modern property rights theory revolves around the relative specificity of buyer and seller investments. According to Woodruff (2002) and Hanson (1995), the less standardized a garment firm's products, the larger its non-contractible investments in workmanship quality, design and distribution to enhance its ability for obtaining future orders. Some pre-survey interview material suggested that garment firms (compared to their fabric suppliers, i.e. the seller) undertake larger non-contractible investment in their monitoring activity, in human capital investments, and in know-how and skill accumulation. Both the garment and the fabric manufacturers' investments are to some extent specific to the characteristics of the end product and in turn to their relationship. This implies that fabric suppliers can behave opportunistically, exploiting the vulnerability of the garment firm, which has already undertaken the larger specific investment. This local condition could be expected to increase the likelihood of vertical integration to avoid hold up by the supplier.

Fashion turnover rate has been used as a measure for investment specificity in the Mexican footwear industry by Woodruff (2002) in his analysis of forward integration into retail; he assumes that the retailer's non-contractible investment is larger and more important to the overall profits from the relationship than that of the manufacturer. Given his assumptions, while transaction cost theory predicts vertical integration,[26] modern property rights theory would predict the likelihood of forward integration to be reduced.[27] In contrast to my findings[28], Woodruff's results support this variant of the property rights theory.

Lock in caused by search and switch costs (p-value=0.12), tax incentives (p-value=0.82), and institutional substitutes proxied by foreign ownership (p-value=0.95), are all insignificant at the 10% level (Table 1: regression 1). Listing on the stock market is insignificant. The insignificance of these variables is not consistent with existing literature, partly because the literature has considered neither tax incentive nor institutional substitute variables. This inconsistency as well as the insignificance of the asset specificity variable may be in part because virtually all existing literature contains only the variables of interest in the estimated models and thus suffer from omitted variable bias, which may render genuinely insignificant variables significant. It may also be so that in developing countries other factors come into play, shaping the incentives for and against vertical integration. Economic theory, developed to fit developed country settings, does not provide sufficient insight into developing country environments. But for some of the insignificant variables, it may also simply be due to sample size, given that only 7 firms in this study were listed on the stock market, 3 of which are integrated.

Some variables only become significant once a more elaborate specification is employed. That both search and switch costs and institutional substitutes were insignificant (the former only moderately so – significant at the 11% level – is somewhat expected). The search and switch cost variable aggregates across foreign and domestic suppliers and the institutional substitute's effect is more likely to operate interactively with other factors affecting integration. Accordingly, three further hypotheses can be explored using the results in Table 1: (1) whether the fact that firms export their garment outputs affects vertical integration; (2) whether

26 On account of the mere existence of specific investments.

27 On account of the retailer's investment being the most important to the relation.

28 Note that my results did not support either theory, as fashion turnover rate is insignificant.

institutional substitutes mitigate the effect of transaction costs; and (3) whether search and switch costs vary according to whether the fabric supplier is domestic or foreign.

Exports and Vertical Integration:

Exports (percentage of garments a firm exported before it integrated) are a quality measure since the quality required for export markets is mostly greater than that for the domestic market. It was unclear whether exports could substitute the quality disputes variable or complement it. The correlation coefficient between the two variables is 0.088 which suggests that exports include other aspects of quality 'disputes over quality' did not capture.

Accordingly, exports were added to the basic regression but were insignificant (Table 3, Regression 9, p-value 0.31), which seems surprising, although case study evidence provides insights as to how the export variable operates. For both the export market and the local high quality market, low quality fabric inputs can cause problems, but not in the same way. Exporters have the option of importing their fabrics, and those serving the domestic market are legally prohibited from this choice – they have to either buy locally or produce the fabric themselves. Hence, it is reasonable to expect: (a) that garment exporters importing their fabric requirements are less likely to integrate as they have access to desired quality and (b) that garment exporters not importing their requirements – given upstream market inefficiencies – are more likely to vertically integrate to ensure the desired quality.

Given the above, the export variable was interacted with an import dummy that would indicate whether a firm imported part or all of its fabric requirements.[29] Regression 10 (Table 3) shows that, as expected, (a) the export variable becomes significant in its own right; and (b) the sign of the interactive term's coefficient is negative, indicating that a firm importing some or all of its fabric requirements moderates the positive effect exports have on vertical integration (indeed it appears to nearly fully offset it).

There are no comparable results in the literature. This variable is case-specific, and so should be used only on a case by case basis, depending on the institutional environment under study.

Institutional Substitutes:

Institutional substitutes mitigate institutional deficiencies. If, for instance, a particular institutional substitute mitigates the limited access to or cost of finance, then one would expect a larger likelihood for vertical integration in its presence. Conversely, if it mitigates an inferior legal system by providing an alternative dispute resolution mechanism, it would reduce the likelihood for integration via reducing the positive effect of, for instance, disputes over quality on vertical integration. Accordingly, the foreign ownership variable – proxying for foreign institutions[30] – was interacted with both the fabric unit investment cost and quality disputes variables (Table 3, regression 11).

Indeed, foreign ownership moderates the negative effect that high investment costs have on vertical integration. The marginal coefficient on the interactive term is significant at the 1.5% level and is positive (β=.0

29 The Import Dummy =1 if fabric imports are more than 0, and 0 otherwise.

30 Foreign institutions are an institutional substitute since they substitute for domestic institutions such as the domestic legal system or domestic financial intermediaries.

37, p-value=0.015, z=2.43) compared to the negative coefficient of the investment cost variable (β=-1.277, p-value=0.000, z=-4.85). Clearly, foreign ownership eases financial constraints to vertical integration, even if this effect is quite modest. The effect of foreign ownership on disputes is not significant, although it has the expected sign (β=-.398, p-value=0.446, z=-0.76).

Institutional substitutes in Egypt, such as foreign ownership and membership to the garment commodity council[31], moderate the negative effect limited access to (and the high cost of) finance have on vertical integration. The council did not exist at the time many of the firms were established or before some integrated. This manifests itself in a mean value of only .026 (7 firms) for this variable prior to integration compared to .071 (19 firms) currently.[32] To explore this further, the current (as opposed to before integration) membership status was interacted with both fabric unit investment cost and the quality disputes variables (regression 12, Table 1). Membership in the council definitely moderates the discouraging effect high fabric unit investment cost (proxying for financial constraints) has on vertical integration. The marginal coefficient on the interactive term is significant at the 11.2% level and is positive (β= 19.151, p-value= 0.112, z= 1.59) compared to the negative coefficient of the investment cost variable (β= -1.235, p-value=0.000, z= -4.36). The effect of membership to the council on financial constraints was relatively large, indicating that influential members of the council have a less severe financial constraint. Precisely, the coefficient on the investment cost variable increases from -1.23 to 17.916 (-0.012345 +0.1915076). As for its effect on quality disputes, membership to the council has an insignificant effect (p-value=0.891, z=0.14).

However, results involving membership in the council need to be viewed with caution, because using current membership as opposed to membership prior to vertical integration gives rise to an endogeneity problem.[33] Results involving membership to the council should therefore be viewed with caution.

No comparable results are to be found in the empirical literature, either because these factors are not important in developed country settings, or because they are simply believed to be unimportant and/or because of the tendency in the literature to limit the variables employed in econometric analysis.

Disaggregated Supplier Search and Switch Costs:

It was clear from preliminary pre-survey interviews that garment producers react to vertical integration differently depending on whether they are dealing with a domestic or a foreign fabric supplier. Thus the data were collected in such a way that allows for separation of search and switch costs data with respect to domestic suppliers and

31 Members of the 'Garment Commodity Council' are non-elected (i.e. appointed by the minister). The Council is a quasi government institution established by the 'Ministry of Trade' to act as a link between the industry and the ministry. Member garment firms introduce recommendations to the minister. Thus, members of the council are influential businessmen and their membership reflects their possession of power.

32 This is a dummy variable, taking the value of 1 if a firm is a member and 0 otherwise.

33 One cannot distinguish whether members of the council are integrated because they had a less severe financial constraint or whether they have a less severe financial constraint because they are integrated.

foreign suppliers. Instead of using the aggregated, weighted[34] search and switch cost variable appearing in regression 1 (Table 1), two variables were used: search and switch costs with respect to domestic fabric suppliers, and search and switch costs with respect to foreign suppliers.

Prior to integration, some firms dealt solely with domestic suppliers, some with foreign ones, and the rest with both types of suppliers. Accordingly, each firm will have at least one non-missing disaggregated search and switch cost variable.[35] So as not to lose those observations for which one of these variables is missing, two missing dummy variables were included.[36] One dummy is a search and switch costs dummy for foreign suppliers and another is for domestic suppliers.

The results (Table 3, regression 13) show that the presence of high search and switch costs increases the likelihood for vertical integration only if the garment firm was dealing with repeat domestic fabric suppliers. But contrary to the prediction that high search and switch costs – a sign of lock in – would stimulate a potential hold-up threat to which garment producers would respond by vertically integrating, if repeat suppliers were foreign (i.e. the fabric was imported prior to integration), no such move occurred (p-value= 0.137, z= -1.49). There are two plausible explanations for this. The first is that when foreign institutions ensure contract enforcement with respect to quality and delivery for a contracted price, suppliers' opportunistic behavior is deterred, reducing the necessity for garment firms to integrate. Hence, the presence of search and switch costs with respect to foreign suppliers does not imply that they actually behave opportunistically. It merely indicates that trust and security exist in the relationship between the garment firm and its repeat foreign fabric supplier. In other words, there is lock in not followed by hold up. This may not be the case with respect to domestic suppliers, since domestic institutions do not guarantee the same level of enforcement.[37]

The second explanation relates to market segment. If search and switch costs are high with respect to domestic suppliers, the garment firm is able to ensure the desired quality of fabrics if it vertically integrates. However, if search and switch costs exist with respect to foreign suppliers, giving rise to hold up, internal production of fabric inputs may not be a sensible response, as the firm cannot match the desired quality level. It is likely that the two justifications jointly explain the difference in significance of the search and switch cost variable depending on supplier nationality.

Two variables lose their significance in regression (13), which may be explained by the multicollinearity introduced by the missing dummies for foreign and domestic suppliers. Since the dummy represents observations (firms) that, for example, do not deal with foreign suppliers there is a systematic relationship between the missing

34 The weight used for the domestic (foreign) search and switch cost variable is the percentage of the total value of fabric requirements purchased, prior to integration, from domestic (foreign) suppliers.

35 Either search and switch costs with respect to foreign suppliers or search and switch costs with respect to domestic suppliers.

36 A missing dummy, DUMX for variable X takes the value 1 if X=missing and 0 otherwise. X itself is replaced with any constant number if X is missing. Hence, a new variable Z is generated such as: Z = constant for X=missing and Z=X otherwise. Both Z and DUMX are added to the right hand side variables of the regression.

37 Or alternatively, when work ethics are different, but this analysis cannot distinguish whether economic agents are responding to the incentive structure or genuinely prefer to behave non-opportunistically.

dummy and vertical integration, hence also with the other variables in the equation which are meant to have a systematic relation with vertical integration. This co-linearity undermines the significance of monitoring costs and quality disputes.[38] It is also plausible that the foreign search and switch cost variable is picking up (part of) the quality effect of the quality disputes variable.

Robustness:

Changing size variables to any other financial size variable such as net assets or garment sales prior to vertically integrating virtually leaves the basic result of regression 1 unaltered (Table 1: regressions 2 and 3).

The percentage of garments sold to women prior to integration is used as an alternative measure for product standardization, hence for asset specificity. As described above, the less the standardization the larger the specific investment and in turn the larger the hold up threat. Like the fashion turnover rate variable, this measure is insignificant and does not alter the basic regression result (Table 1, regression 4).

Replacing disputes over quality with a variable measuring the extent to which desired fabric quality was available on the market prior to making the decision to integrate also maintains the basic result (Table 1, regression 5). Dropping some insignificant variables such as fashion turnover rate and tax incentives, hardly alters the results (Table 1, regressions 6 and 7). And finally, including other controls such as age and whether the firm is an inherited family business does not alter the results (Table 1, regression 8). The last regression shows both the age of the firm as well as the family business variable to be insignificant. The prediction was that both would increase the degree of vertical integration on account of industry experience, and also because the latter variable is a reasonable proxy for access to finance from family members. Its insignificance maybe due to the fact that industry experience may boost horizontal integration as much as it boosts vertical integration. In addition, access to finance is already controlled for by the investment cost variable.

Conclusion:

This modeling approach adopts two innovations to the vertical integration literature: (1) use of fractional response models, and (2) avoiding endogeneity to some extent. The dependent variable is measured as the degree of vertical integration (i.e. fraction of fabric inputs which are produced in house rather than bought) rather than as a dichotomous variable, as has usually been the case.[39] The endogeneity problem which has plagued the literature is partially avoided, as data were collected on decision-maker perceptions and firm characteristics in the year(s) preceding integration, so that nearly all regressors are pre-determined.

The analysis identified two groups of forces – one constraining the ability to integrate and the other facilitating it – which on balance determine whether a firm will be

38 The missing dummy for foreign supplier search and switch cost takes on the value of 1 if the firm did NOT deal with foreign suppliers, i.e. if it only dealt with domestic suppliers before integration. The correlation coefficient equals (-.30) between the dummy and quality disputes and equals (0.20) monitoring costs. Both coefficients are large.

39This change makes a difference to the results despite the fact that only half of all integrated firms (12 percent of the whole sample) have non-integer levels of integration (i.e. $0<VI<1$). Corresponding probit and logit regressions are available from the author upon request.

integrated or not.[40] First are forces that hinder the ability to or limit the desire to integrate. Some of these forces are consistent with existing economic theory on vertical integration and others – despite potentially applicable in other settings – have not been considered by economic theory on vertical integration. Some constraints may well be more acute in a developing country such as Egypt, where certain market imperfections are present (e.g. credit market imperfections). Second are forces that can mitigate these constraints, notably the presence of institutional substitutes.

Thus the foremost argument in this paper is that the institutional setting matters. Some variables commonly held to be important determinants of vertical integration were not so in the case of the Egyptian garment industry, whereas other variables, which are not normally considered, do matter.

While evidence was found in support of demand variability theories and risk adjusted property rights theory, agency theory, financial constraints, economies of scale, moral costs towards repeat suppliers and aspects of quality concerns, no evidence was found to support asset specificity; i.e. the modern property rights theory.[41][42] Asset specificity is usually at the top of the list of determinants of vertical integration. However, here it was insignificant.

Instead, the order of importance in the Egyptian garment industry is that: demand variability, firm size, financial constraints, sales uncertainty, social and moral costs and market segment (proxied by disputes over quality and the importance of timely delivery to the garment producer) are the most important determinants of vertical integration. Limited access to finance prevents many firms from undertaking the investment required to integrate. Firms with greater capital (or garment output or net assets) prior to integration are more likely to produce their own fabrics, both because they have better access to finance and to exploit economies of scale. Demand variability and sales uncertainty make firms more likely to rely on the market, hence discouraging vertical integration. Whilst monitoring costs do hamper vertical integration, social and moral costs do not constrain firms from choosing to integrate if this would be efficient. Producers of higher quality garments (in terms of both product quality and timely delivery) possess higher degrees of vertical integration in order to ensure the required quality level.

The paper has also introduced other context-specific determinants. First, there are some nuances related to market segment. Higher quality garment firms tend to rely on imported textiles since the required fabric quality is unavailable domestically. Contrary to theoretical predictions, these producers do not integrate even if search and switch costs are high. But the opposite is true of producers relying on domestic suppliers. One interpretation of this result is that foreign institutions ensure contract enforcement with respect to quality and on time delivery so that suppliers' opportunistic behavior is deterred, reducing in turn the necessity of garment firms to integrate in response to high search and switch costs. This may not be the case with respect to domestic suppliers, where domestic institutions do not guarantee the same level of enforcement. Exporters that do not rely on the import market for their inputs

40And if integrated then to what extent?

41 Or this aspect of transaction cost theory as opposed to human asset specificity for instance.

42 To test modern PRT would require a different questionnaire and survey design. However, in my analysis I rely on variables already used in other papers, to test a variant of the modern PRT.

have higher degrees of vertical integration. This supports human asset specificity and is consistent with transaction cost theory.

Thus factors in addition to the ones currently identified in the vertical integration literature are just as important. This has two implications. The first relates to theory. Theories actually are more likely to complement each other than to compete against one another. The second, however, is empirical. Existing and future empirical work focusing on only one explanation for vertical integration suffers from omitted variable bias. The findings from this study thus have a clear implication for future research: studies of the determinants of vertical integration need to incorporate the full range of determinants suggested by theory in addition to factors which are specific to the institutional context being studied. Failure to do this can both invalidate the empirical results and limit progress in identifying the full story as to why firms integrate. There is thus considerable scope for further research on the underlying causes of vertical integration.

Finally, it is important to note a number of things. First, is that the findings of this paper pertain to a certain type of integration, to one country and to one industry, and care should be taken in generalization. Second, results pertaining to the garment commodity council and to the percentage of fabrics provided by a firm's sister company or branch should be treated with caution for possible endogeneity associated with regressing current vertical integration status on current firm characteristics. Thirdly, whilst the approach used has reduced problems of endogeneity and omitted variable bias, the continued presence of such problems cannot be ruled out. Finally, even though financial constraints, social costs and institutional substitutes may have a stronger impact in a developing country such as Egypt, these determinants are by no means confined to developing countries and accordingly should be tested in developed country models.

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Table 1: Maximum Likelihood Estimation Results

	Basic Regression	Size Measures		Asset Specificity	Quality Measures	Parsimonious		Other Controls
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Quality disputes	0.502 (0.059)**	0.722 (0.083)**	0.641 (0.082)**	0.582 (0.012)**		0.539 (0.031)**	0.535 (0.035)**	0.500 (0.060)**
Search & switch cost	0.259 (0.115)	0.383 (0.147)	0.578 (0.022)**	0.267 (0.103)	0.249 (0.127)	0.255 (0.122)	0.252 (0.122)	0.258 (0.113)
Social & moral cost	0.366 (0.031)**	0.461 (0.085)*	0.343 (0.129)	0.380 (0.019)**	0.373 (0.022)**	0.377 (0.024)**	0.378 (0.021)**	0.366 (0.030)**
Temporal specificity (D)	1.758 (0.001)***	2.006 (0.016)**	2.272 (0.010)**	1.678 (0.001)***	1.532 (0.001)***	1.761 (0.001)***	1.756 (0.001)***	1.758 (0.001)***
Fashion turnover rate	0.002 (0.499)	0.002 (0.562)	0.000 (0.898)		0.003 (0.26)			0.002 (0.499)
Monitoring Cost	-0.284 (0.086)*	-0.494 (0.030)**	-0.333 (0.105)	-0.286 (0.081)*	-0.270 (0.088)*	-0.299 (0.077)*	-0.296 (0.092)*	-0.285 (0.093)*
Demand variability	-1.036 (0.000)***	-1.377 (0.000)***	-1.049 (0.000)***	-1.050 (0.000)***	-0.990 (0.000)***	-1.043 (0.000)***	-1.041 (0.000)***	-1.035 (0.000)***
Demand uncertainty	-0.483 (0.025)**	-0.665 (0.030)**	0.749 (0.005)***	-0.479 (0.031)**	-0.463 (0.025)**	-0.468 (0.040)**	-0.466 (0.036)**	-0.484 (0.026)**
Log issued capital	0.583 (0.000)***			0.552 (0.000)***	0.510 (0.000)***	0.572 (0.000)***	0.568 (0.000)***	0.584 (0.000)***
Fabrics unit investment cost	-1.170 (0.000)***	-1.651 (0.000)***	-1.551 (0.000)***	-1.072 (0.000)***	-1.119 (0.000)***	-1.164 (0.000)***	-1.165 (0.000)***	-1.173 (0.000)***
% Foreign ownership	0.000 (0.953)	0.017 (0.235)	0.013 (0.327)	0.000 (0.981)	0.002 (0.857)	0.004 (0.749)	0.004 (0.715)	0.000 (0.956)
Listed on stock market (D)	-0.893 (0.276)	-0.768 (0.472)	-1.041 (0.212)	-0.801 (0.252)	-0.821 (0.212)	-0.881 (0.218)	-0.888 (0.196)	-0.898 (0.275)
Tax incentive	-0.046 (0.823)	0.104 (0.712)	0.050 (0.83)	0.010 (0.963)	0.038 (0.844)	-0.031 (0.882)		0.048 (0.813)
% Fabrics provided by sister company or branch	-0.122 (0.000)***	-0.139 (0.000)***	-0.110 (0.000)***	-0.118 (0.000)***	-0.113 (0.000)***	-0.113 (0.000)***	-0.111 (0.000)***	-0.122 (0.000)***
Net assets		0.573 (0.000)***						
Garment sales			0.682 (0.002)***					
Age								0.000

Table 1: Maximum Likelihood Estimation Results (Cont.)

								(0.98)
Family inherited business (D)								-0.042
								(0.956)
Non-available desired fabric quality					0.232			
					(0.189)			
% sold to women				0.009				
				(0.309)				
Number of Observations	243	242	237	242	244	244	245	243
Log Likelihood	-44.815	-47.533	-47.376	-44.641	-45.602	-45.045	-45.066	-44.814

1. Following Papke and Wooldridge (1996), the conditional distribution of the dependent variable (VI) on the independent variables (X), E(VI|X)=G(.), is estimated by assuming a particular distribution of the conditional distribution, which is then estimated by maximum likelihood (MLE). The conditional distribution of VI on X is assumed to be the logistic distribution, i.e. $G(.)= (e^{Xb}/1+ e^{Xb})$. For more information refer to Appendix?
2. Coefficients are marginal effects (percentages); p-values in parentheses, variables followed by (D) are dummy variables.
3. p-weights are used in all regressions.
4. Robust standard errors are specified in all regressions.

significant at the 10% level ; ** significant at the 5% level; *** significant at the 1% level

Table 2: Marginal Effects- of a One Standard Deviation Change in the X Variable - in % for Basic Regression Ordered by Importance

	Marginal effect of 1 SD change (x100)	
	At the means	At VI fit=.56
Demand variability	-0.67***	-34.15***
Log issued capital	1.56***	31.99***
Fabrics unit investment cost	-0.51***	-30.92***
% Fabrics provided by sister company or branch	-0.22***	-25.04***
Demand uncertainty	-0.71**	-14.52**
Temporal specificity (D)	0.63***	17.84***
Social & moral cost	0.60**	12.30**
Quality disputes	0.58*	11.87*
Monitoring Cost	-0.46*	-9.45*
Search & switch cost	0.45	9.15
Fashion turnover rate	0.23	4.33
Listed on stock market (D)	-0.15	-4.27
% Foreign ownership	0.00	0.28
Tax incentive	0.00	1.37

1) All marginal effects are shown for a one standard deviation increase from the mean and from the used regressor values respectively.
2) Variables followed by (D) are dummy variables
3) * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level

Table 3: Exports, Interactive Institutional Substitutes & Disaggregated Search & Switch Cost

	Basic Regression (1)	Including % Exported (9)	Including % Exported & Imports Interaction (10)	Foreign Ownership Interaction (11)	Garment C. Council Interaction (12)	Disaggregated Search and Switch Cost (13)
Quality disputes	0.502	0.491	0.478	0.456	0.319	0.010
	(0.059)*	(0.084)*	(0.084)*	(0.11)	(0.194)	(0.959)
Search & switch cost	0.259	0.192	0.207	0.235	0.219	
	(0.115)	(0.271)	(0.236)	(0.128)	(0.13)	
Social & moral cost	0.366	0.417	0.388	0.360	0.287	0.282
	(0.031)**	(0.025)**	(0.040)**	(0.036)**	(0.071)*	(0.045)**
Temporal specificity (D)	1.758	1.742	1.687	1.799	0.017	1.659
	(0.001)***	(0.002)***	(0.003)***	(0.001)***	(0.000)***	(0.000)***
Fashion turnover rate	0.002	0.002	0.002	0.002	0.002	0.000
	(0.499)	(0.511)	(0.504)	(0.464)	(0.319)	(0.576)
Monitoring Cost	-0.284	-0.320	-0.321	-0.298	-0.265	-0.119
	(0.086)*	(0.061)*	(0.072)*	(0.090)*	(0.107)	(0.335)
Demand variability	-1.036	-1.028	-1.010	-1.024	-0.948	-0.669
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Demand uncertainty	-0.483	-0.458	-0.488	-0.548	-0.520	-0.459
	(0.025)**	(0.032)**	(0.022)**	(0.013)**	(0.009)***	(0.010)***
Log issued capital	0.583	0.532	0.560	0.586	0.512	0.439
	(0.000)***	(0.001)***	(0.001)***	(0.000)***	(0.000)***	(0.000)***
Fabrics unit investment cost	-1.170	-1.178	-1.176	-1.277	-1.235	-1.005
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
% Foreign ownership	0.000	0.001	0.002			-0.007
	(0.953)	(0.934)	(0.859)			(0.454)
Listed on stock market (D)	-0.893	-.948	-0.835	-0.916	-0.830	-0.961
	(0.276)	(0.255)	(0.335)	(0.296)	(0.303)	(0.016)**
Tax incentive	0.046	-0.041	-0.088	-0.075	-0.024	0.089
	(0.823)	(0.835)	(0.669)	(0.723)	(0.905)	(0.63)
% of fabrics provided by sister	-0.122	-0.116	-0.119	-0.126	-0.120	-0.076
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
% Exported		0.009	0.018			
		(0.313)	(0.078)*			
% Exported*Import Dummy			-0.016			
			(0.186)			
Foreign ownership DM*finance				0.037		
				(0.015)**		
Foreign ownership DM*disputes				-0.398		
				(0.446)		
Foreign ownership dummy (D)				-1.072		
				(0.236)		
Membership to council*disputes					0.078	
					(0.891)	
Search & switch cost w.r.t. domestic suppliers						0.349
						(0.032)**
Search & switch cost w.r.t. foreign suppliers						-0.406
						(0.137)
Missing dummy (domestic)						-0.773
						(0.193)
Missing dummy (foreign)						-13.227
						(0.006)***
Membership to council*finance					19.151	
					(0.112)	
Current membership to Garment Commodity Council(D)					-1.230	
					(0.080)*	
Observations	243	243	243	243	243	243
Log Likelihood	-44.815	-44.384	-43.861	-44.057	-43.262	-39.314

1) MLE as specified above, coefficients are marginal effects (percentages), p values in parentheses, variables followed by (D) are dummy variables.
2) p-weights are used in all regressions.
3) Robust standard errors are specified in all regressions.
4) significant at the 10% level ; ** significant at the 5% level; *** significant at the 1% level

Annex 1: Selected Survey Questions

Variable	Corresponding Survey Question
Vertical Integration	With respect to fabrics used for garments sold on the domestic market: During the last completed financial year/prior to internal production of fabrics, what percentage of total requirements of these fabrics did you produce internally, what percentage did you purchase from domestic producers and what percentage did you purchase from foreign producers (i.e. imported)?

	The Domestic Market	
	Last Completed Financial Year (1)	Prior to Internal Production of Fabrics (2)
Internal Production	%	0%
Domestic Suppliers	%	%
Foreign Suppliers	%	%
TOTAL	100%	100%

With respect to fabrics used for garments sold on the export market: During the last completed financial year/prior to internal production of fabrics, what percentage of total requirements of these fabrics did you produce internally, what percentage did you purchase from domestic producers and what percentage did you purchase from foreign producers (i.e. imported)?

	The Export Market	
	Last Completed Financial Year (1)	Prior to Internal Production of Fabrics (2)
Internal Production	%	0%
Domestic Suppliers	%	%
Foreign Suppliers	%	%
TOTAL	100%	100%

Quality Disputes	Prior to producing your own fabrics, how frequent did you encounter disputes over quality with your domestic/foreign fabric suppliers? *5 point scale from "absolutely no disputes" to "very frequent".* Note: the variable is a weighted average, where the weights are the % of domestically purchased fabrics and the % of imported fabrics in total fabrics requirements.
Non-available desired fabric quality	*Give the level of dis/agreement with the following statement: The answer was given on a 6 point scale from "strongly disagree" to "strongly agree".* Prior to producing your own fabrics, it was difficult to find the fabric quality level and specifications that match your standards on the domestic market.

Variable	Corresponding Survey Question
Supplier Search & Switch Costs	*Give the level of dis/agreement with the following statement: The answer was given on a 6-point scale from "strongly disagree" to "strongly agree".* Prior to producing fabrics internally, search and switch costs involved in altering fabric suppliers, rendered it difficult for you to switch from any of your repeated (domestic/foreign) fabric suppliers at the time.
Fabric Supplier Social Cost	*Give the level of dis/agreement with the following statement: The answer was given on a 6 point scale from "strongly disagree" to "strongly agree".* Prior to producing fabrics internally, social and moral costs involved in altering fabric suppliers, rendered it difficult for you to switch from any of your repeated (domestic/foreign) fabric suppliers at the time (e.g. the cost of losing a friend, family rejection for cutting dealings with a family supplier or a supplier who is a family friend).
Fashion turnover rate	In the years prior to producing your own fabrics, on average, how long did you expect the demand on a new style the company will be introducing to the market during its first few years of integration persist? Codes: 1.Day 2. Week 3. Month 4. Year 5. Season Note: Answer was converted to weeks.
% sold to women	% of garment sales to women in the last completed financial year prior to vertical integration.
Monitoring Cost	*Give the level of dis/agreement with the following statement: The answer was given on a 6 point scale from "strongly disagree" to "strongly agree".* Prior to producing your own fabrics you thought that monitoring workers undertaking fabrics production is a very difficult task. (i.e. time, money and hassle involved in monitoring the workers)
Demand Variability	In the years prior to producing your own fabrics, on average, how variable did you expect the demand on your products to be during the first few years of integration? The answer was given on a 6 point scale from "absolutely invariable" to "very variable".
Uncertainty	Was this sales value (remind the respondent of his sales answer)….? 1) Absolutely expected 2) Expected 3) Somewhat expected 4) Somewhat unexpected 5) Unexpected 6) Absolutely unexpected

Variable	Corresponding Survey Question
Size Variables	In the given years, how much was the value of the company's issued capital (garment sales; net assets)? 1=£E 2=$
Fabric Unit Investment Cost	*Give the level of dis/agreement with the following statement: The answer was given on a 6 point scale from "strongly disagree" to "strongly agree".* Prior to producing your own fabrics, you thought that opening up a fabric production unit in the company is a very expensive undertaking (that refers to all investment costs of buying the machines, the extra space required, preparing the space as well as any other costs involved in opening up the fabric production unit).
% Foreign ownership	% of foreign ownership in the last completed financial year prior to vertical integration.
Stock Market Status	If company was listed on the stock market prior to vertical integration. 1. Yes 0. No
Tax Incentive	*Give the level of dis/agreement with the following statement: The answer was given on a 6 point scale from "strongly disagree" to "strongly agree".* Prior to producing your own fabrics, you thought that producing fabrics internally**,** instead of purchasing them from the market, may reduce the company's tax burden.
% Fabrics provided by sister company or branch	% of value of firm's total fabric requirements currently provided by a sister company or branch.
Family Inherited Business	Is this company considered an inherited family business? (not necessarily literally inherited, father may be -thanks are due to God (Alhamdu li Allah) –still alive.) 1. Yes 0. No

Annex 2: Variable Statistics and Expected Signs

	Mean			Standard Deviation			Minimum			Maximum			Expected sign
	VI	Non-VI	All	VI	Non-VI	All	VI	Non-VI	All	VI	Non-VI	All	
Degree of VI													
All firms: 0≤VI≤1	0.78	0.00	0.19	0.30	0.00	0.36	0.05	0	0	1	0	1	
0<VI<1	0.53	n.a.	n.a.	0.30	n.a.	n.a.	0.05	n.a.	n.a.	0.97	n.a.	n.a.	
Quality													
Quality disputes	3.87	2.96	3.17	1.08	1.09	1.16	1	1	1	5	5	5	+
Non-available desired fabric quality	4.57	3.20	3.53	1.51	1.73	1.78	1	1	1	6	6	6	+
Lock in & hold up (TCT)													
Search & switch cost	4.62	3.37	3.67	1.57	1.67	1.73	1	1	1	6	6	6	+
Social & moral cost	3.45	2.92	3.05	1.85	1.55	1.64	1	1	1	6	6	6	+
Temporal specificity (D)	0.91	0.83	0.85	0.28	0.37	0.36	0	0	0	1	1	1	+
Lock in & hold up (MPRT)													
Fashion turnover rate (in weeks)	111.81	48.02	63.24	171.08	85.35	114.78	4.4	1	1	522	522	522	+
% sold to women	29.74	44.69	41.15	33.51	44.83	42.84	0	0	0	100	100	100	+
Agency Theory													
Monitoring cost	3.19	4.46	4.16	1.36	1.58	1.62	1	1	1	6	6	6	-
Desire to Avoid Risk													
Demand variability	2.59	4.83	4.29	1.30	1.29	1.61	1	1	1	6	6	6	-
Demand uncertainty	2.45	3.51	3.26	1.17	1.46	1.47	1	1	1	6	6	6	-
Firm Size													
Issued capital (in logs)	13.04	9.83	10.60	2.61	2.20	2.68	8.07	5.90	5.90	17.86	18.65	18.65	+
Net assets (in logs)	14.64	11.66	12.40	2.63	2.32	2.72	8.73	6.82	6.82	19.76	18.74	19.76	+
Garment sales (in logs)	16.04	12.07	13.07	2.76	2.36	3.01	9.27	6.56	6.56	23.21	19.36	23.21	+
Financial constraints													
Fabrics unit investment cost	3.69	5.67	5.20	1.49	0.75	1.29	1	2	1	6	6	6	-
Institutional substitutes													

	Mean			Standard Deviation			Minimum			Maximum			Expected sign
	VI	Non-VI	All	VI	Non-VI	All	VI	Non-VI	All	VI	Non-VI	All	
Membership to Garment Commodity Council (D)	0.00	0.04	0.03	0.00	0.19	0.17	0	0	0	0	1	1	+/-
Current membership to Garment Commodity Council (D)	0.21	0.04	0.08	0.41	0.19	0.27	0	0	0	1	1	1	
% of foreign ownership	8.62	2.08	3.64	28.31	13.37	18.24	0	0	0	100	100	100	+/-
Lawyer (D)	0.21	0.34	0.30	0.41	0.47	0.46	0	0	0	1	1	1	+/-
Current lawyer (D)	0.57	0.35	0.40	0.50	0.48	0.49	0	0	0	1	1	1	
Other controls													
Listed on stock market (D)	0.05	0.02	0.03	0.22	0.15	0.17	0	0	0	1	1	1	+/-
Tax incentive	3.00	2.56	2.67	1.52	1.44	1.47	1	1	1	6	6	6	+
% of fabrics provided by sister company or branch	1.55	1.24	1.32	11.84	9.39	10.00	0	0	0	90	90	90	-
Age	22.31	20.68	21.07	13.75	13.40	13.48	2	1	1	57	69	69	+/-
Family Business (D)	1.67	1.73	1.72	0.47	0.45	0.45	1	1	1	2	2	2	+/-

1. Level of (dis)agreement variables are coded from "strongly disagree=1" to "strongly agree=6". For the disputes question the answers were coded "absolutely no disputes=1" to "very frequent=5"
2. All variables refer to the period prior to integration with the exception of the percentage of fabrics provided by sister company and/or branch.
3. VI= Vertical Integrated, TCT=Transaction Cost Theory, MPRT=Modern Property Rights Theory
4. Variables followed by (D) are dummy variables.
5. n.a.= not applicable