Supplier reputation and price premium: the case of groundnuts in Rotterdam

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This may explain observed price differences between commodities from different origins but with the same observable characteristics. We analyse data for the Rotterdam market and use hedonic price analysis to show the existence of a price premium that favours the US over other origins. As secondary information points out exporter reliability as one explanation we formalise the relationship between reliability and price premiums in a theoretical model and analyse its implications.

Keywords: *firm reputation, supplier reliability, price differences, groundnuts trade, hedonic analysis, country of origin*

Introduction

The motto of a current English commodity trading firm is composed of the following two phrases: "Always in the right place at the right time" and "Your quality, at a competitive price" (Carrex International Ltd., 2002). These two phrases, conveying what the firm stands for, are the key for understanding that the reputation of a firm is not only based on the quality of the goods it offers but also on its reliability as a supplier, understanding reliability as delivering the product of the agreed quality at the agreed time.

The literature about quality and reputation has focused more on the observable characteristics of the product and less on suppliers' reliability. Namely, it has considered the effect of quality uncertainty on prices (Stiglitz, 1987) and how high quality products receive a premium with respect to those of lower quality. Specific to the price premium case, Shapiro (1983) considers a competitive model within the framework of firm reputation and imperfect consumer information. In his model, on the one hand, firms that have the reputation of producing high quality products receive a premium above their costs, this premium compensating the initial investments made for building reputation. On the other hand, new entry firms accessing the high quality segment of the market will be selling at a below-cost price while investing in reputation. Therefore, until the

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new entry firm reaches the reputation of the established firms, the market will reflect a price premium in favour of the established firms' products. In the context of international trade, Falvey (1989) in a model of quality uncertainty stated that a premium is generated for those countries with reputation for selling high quality products.

In agriculture, issues of quality and reliability are particularly important due to the fact that agricultural production is exposed to the vagaries of mother nature. Weather can deteriorate a harvest and reduce not only its size but also that portion of the crop corresponding to an exportable quality. It is important to note that the damage affects not only farmers but also the entire supply chain since a purchaser in one stage of the chain may be a supplier in the next stage. In this sense, if the production of an agricultural firm or country is more exposed, for instance, to weather problems, purchasers may perceive the firm or the country as a risky one or, which is the same, as a less reliable one. This line of reasoning has been pointed out by Chamberlin (1965): “Not only goods, but sellers, must be "standardized" under pure competition. Anything which makes buyers prefer one seller to another, be it personality, reputation, convenient location, or the tone of his shop, differentiates the thing purchased to that degree, for what it is bought is really a bundle of utilities, of which these things are part” (1965, p. 8-9).

International agricultural trade has applied measures such as grading in order to standardise products and ensure their homogeneity. However, in some instances, such as the case of the groundnuts traded on the Rotterdam market, one may still observe price premiums paid for the commodity of some specific origin. An alternative way to differentiate products when the quality is homogeneous is by the reliability of the supplier, an aspect that has been studied less than quality differentiation in the context of international trade. Reliability is an important factor because, even if the quality of the product is standard, late delivery may imply additional costs for the purchaser, which therefore may be reflected in price premiums for reliable suppliers or discounts for unreliable ones.

The purpose of this paper is to address the importance of suppliers’ reliability among the reasons for the observed difference in price for a certain commodity. We believe that this is the case of the groundnuts sold in Rotterdam, where the US groundnuts receive a premium with respect to groundnuts from other origins, despite being of the same quality.

Exporters’ reliability is particularly significant in international trade, where one can observe differences in prices of a commodity from different origins, even though they have the same observable characteristics. Despite its importance for the developing countries endeavouring to access the already established markets, the topic has been neglected in the international economic literature.

The paper starts with some stylised facts about price premiums paid for US groundnuts in the Rotterdam market, for which we estimate a hedonic price equation for groundnuts from different origins. Next, we formalise the relationship between reliability and price premiums in a theoretical model. Finally, we present some conclusions.

Stylised Facts on Price Premiums for US Groundnuts in the Rotterdam Market

The purpose of this section is to present evidence about the price premium paid for the US groundnuts traded on the Rotterdam market even controlling for observable characteristics, such as variety (e.g. Runners), size (i.e., measured as counts per ounce), and others (e.g., with shell/ shelled (i.e., without shell); blanched (i.e., without the reddish skin covering the groundnut kernels); split (i.e., broken kernel), etc.).

To estimate the premiums we use a hedonic price equation, which considers regression analysis of the price on the characteristics of the product. The implicit price of a characteristic is defined as the derivative of the price with respect to the product attribute. If the estimated implicit price is not significantly different from zero, then either the characteristic is not valued by the consumers or it is not considered important in connection with the product (Combris et al., 1997).

Appropriate data to estimate price premiums to one or more groundnut origins are difficult to find. Ideally, one should perform the analysis using prices paid to exporters for groundnuts from different origins and qualities. The closest available data are export unit values (i.e., the ratio between exported value and quantity), however, even when disaggregated by six digit customs code, which is the maximum level of disaggregation available for European Union trade data, these still convey an important degree of aggregation (e.g., considering different sizes or varieties). In addition, the observed unit values may also represent imports contracted at different times, which renders it difficult to compare the prices from different groundnut origins.

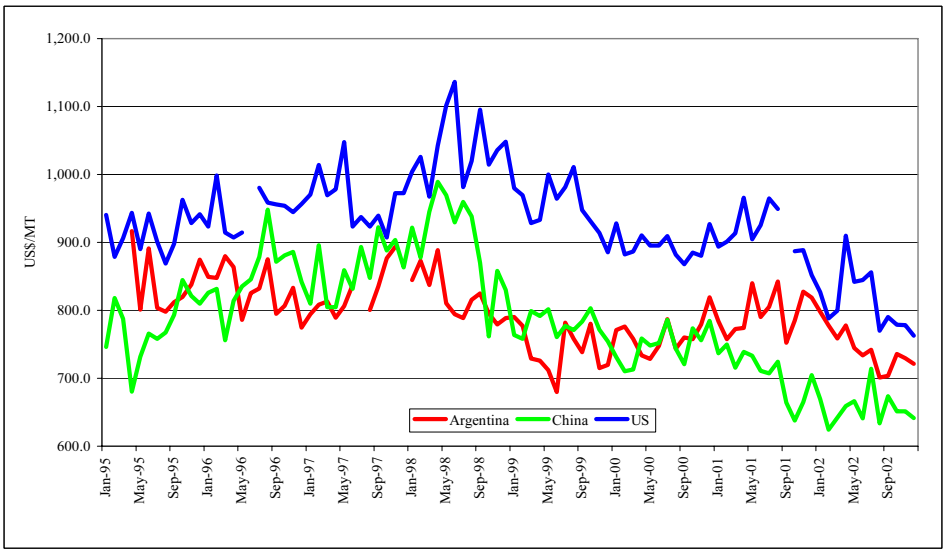

Figure 1. Netherlands, Import unit values from Argentina, China, and US 1995-2002

However, as observed in figure 1, despite the aforementioned shortcomings since most of the trade on shelled groundnuts is concentrated on the medium size groundnuts, i.e., the 40/50 size, it is possible to crudely infer that US groundnuts are sold at a premium compared to groundnuts from the other two important origins that export to the Netherlands, namely Argentina and China. For the period 1995-2002, the unit values indicate that on average US groundnuts exporters received a premium of 136 US$ per metric ton (with a coefficient of variation of 51.9 percent) with respect to Argentine exporters and 147 US$ per metric ton (with a coefficient of variation of 39.5 percent) with respect to Chinese exporters.

As unit values are not appropriate for the hedonic analysis, we used data from the price lists of Aldebaran Commodities (2002), a major trader of groundnuts in Rotterdam. The prices reported in the price lists are sale prices and not the prices paid for the groundnuts. Therefore, we assumed that the differences in prices showed in Aldebaran price list also reflected the differences in prices paid for groundnuts from different origins (which seems a good approximation based on figure 1). In other terms, for instance, if the price list shows that the US groundnuts price is higher than the price of Argentine groundnuts on the Rotterdam market, this means that US groundnut exporters are also paid a higher price than Argentine groundnut exporters (though the premium is, of course, different when computed from the price lists than from payments to exporters). This is shown in Table 1.

Table 1. Comparison between unit values and Aldebaran Commodities prices

	Argentina	China	US	Brazil	South Africa	Sudan
Unit Values						
2001	795.8	707.3	913.2	701.5	787.4	579.8
2002	743.7	655.6	812.2	641.5	652.8	497.8
Aldebaran Commodities 1/						
2001	786.3	735.0	826.7	785.0	823.3	n.a.
2002	712.5	673.8	787.5	696.3	780.0	n.a.

Note:

n.a. denotes "not available"

1/ Only 40/50 size. Aldebaran data for Sudan is only for sizes greater than 40/50.

The hedonic price model to be estimated is given by the following equation:

$$P_i = \beta_0 + \beta_1 Z_1 + \beta_2 Z_2 + \beta_3 Z_3 + \beta_4 Z_4 + \beta_5 Z_5 + \beta_6 Z_6 + \beta_7 Z_7 + \beta_8 Z_8 + \beta_9 Z_9 \quad (1)$$

Where P_i is the price in US$/MT of the groundnuts type i, β_0 intercept, Z_1 dummy (Argentine=1, otherwise=0), Z_2 dummy (Chinese=1, otherwise=0), Z_3 dummy (South Africa=1, otherwise=0), Z_4 dummy (Brazil=1, otherwise=0), Z_5 dummy (Sudan=1, otherwise=0), Z_6 size (38/42 size equal to 0 and increasing with smaller sizes), Z_7 dummy (Runner=1, otherwise=0), Z_8 dummy (Blanched=1, otherwise=0), Z_9 dummy (Split=1, otherwise=0).

The explanatory variables can be divided into two groups: observable characteristics and country of origin. The two main observable characteristics for groundnuts are variety and size. As regards groundnut varieties, we created a dummy variable to differentiate Runners from the other varieties. This was done not only because Runners is the variety that receives the highest prices among groundnuts but also to save degrees of freedom given the limited size of the sample. The variable size was converted to a discrete variable taking value zero for groundnuts of size 38/42 (which is the biggest size) and progressively higher values for groundnuts of smaller sizes. Other observable characteristics considered relate to whether the groundnuts were blanched or split. They have to be taken into consideration in the explanation of prices because they represent a higher degree of processing of the shelled groundnuts.

The country of origin was introduced by means of intercept dummies. We included dummies to distinguish between groundnuts originating from Argentina, Brazil, China, South Africa, and Sudan. Therefore, the intercept (i.e., holding all the country variables equal to zero) represents the US price. An important aspect is that the trader is a direct importer.

The estimated hedonic equations are presented in Tables 2a and 2b. Table 2a presents the estimates of a linear equation and Table 2b presents the results of a logarithmic equation (continuous variables are expressed in logarithms while dummy variables take values of zero and one). Both tables present the results of four equations, two equations for 2001 prices and two for 2002 prices.

The difference between the equations for each year is represented by the variable "stocks" that we included in order to control for the case when the level of stock on hand has some effect on the price. This is in the case that the trader decides to reduce the price of the groundnuts in order to reduce his stocks. All the estimations were carried on by OLS and considering White's heteroskedasticity consistent covariance, to correct possible problems in the estimation of the variance-covariance matrix due to the use of cross section data.

If one exporting country is considered more reliable than others, then the prices for groundnuts from that specific origin should show a premium with respect to prices for groundnuts from other origins considered less reliable, after taking into account the observable characteristics of the groundnuts. However, the regression presented here only provides evidence of the existence of the price premium irrespective of its deter-

mining factors (e.g., reliability). There may be other reasons such as in the case of China, whose exported groundnuts have recurrently shown the presence of Aflatoxin (i.e., a toxic metabolite produced by certain fungi in/on foods and feeds and known to cause cancer in animals); however, this not the case of the Argentinean groundnuts.

Overall, the combination of country of origin and observable characteristics explains a substantial share of the observed price variation. The R^2 coefficients in the regressions go from 0.71 to 0.90, and the F-statistics show that all the regressions are significant at 5 percent. In addition, the tables present the Ramsey RESET test (Ramsey, 1969) which cannot reject at 1 percent significance the null hypothesis that the equations are correctly specified.

Since we are taking into account all the groundnut origins, the intercept represents the price of US groundnuts size 38/42, and the dummy variables represent premiums (if the sign is positive) or discounts (if the sign is negative) with respect to the US price. US groundnuts receive a premium with respect to the Argentine, Chinese, and Brazilian groundnuts. With respect to the Argentine groundnuts, the US premium goes from US$ 45 per Metric Ton in year 2002 to US$ 231 per Metric Ton in year 2001. This premium range is similar to the one with respect to Brazil, which goes from US$ 64 per Metric Ton in 2002 to US$ 143 per Metric Ton in 2001. With respect to the Chinese groundnuts, the US premium goes from US$ 158 per Metric Ton in 2002 to US$ 200 per Metric Ton in 2001. With respect to the price of groundnuts from African countries (South Africa and Sudan), US groundnuts seem to carry a premium, although the premium is not statistically different than zero.

From the groundnut observable characteristics variables, size and blanched are significant in explaining differences in prices. An increase in the variable size (i.e., a decrease in the groundnut size) implies a decrease in the groundnut price by US$ 16 per Metric Ton in year 2002 and by US$ 14 per Metric Ton in year 2001. In addition, if blanched, the groundnut price increases by US$ 157 per Metric Ton in year 2002 and US$ 87 per Metric Ton in year 2001.

With respect to the groundnut variety, Runner variety seems to carry a premium with respect to the other varieties, however, this result is not robust since it was observed only for the year 2001 regressions, where the premium is equal to US$ 77 per Metric Ton. Similarly, the effect of the stock on hand on the groundnut price was found statistically significant only in the 2001 sample, showing an elasticity equal to -0.1.

Modelling the premium to supplier reliability

The evidence presented in the previous section shows a price premium that favours US groundnuts over other origins. While there may be several possible explanations, we are interested in the issue of exporter reliability as a source of price premium. The reason is based on Carley et al. (1995) who pointed out that "reliability of timely delivery of groundnuts is a major factor in the export market. China had a problem with time and reliable delivery in 1993. Argentina had problems in 1991 on reliable delivery. […] Many of these factors impact on price." (1995, p. 76).

Table 2a. Hedonic regression analysis - Linear regression

Dependent variable: Shelled groundnut price

Equation	Year	Estimated coefficients and t-statistics												Adjusted	F	Ramsey
		Intercept	Argentina	China	South Africa	Brazil	Sudan	Size	Runner	Blanched	Split	Crop	Stock	R^2	statistic 1/	statistic 2/
1	**2002**	810.08	-45.85	-158.04	-33.19	-64.68		-15.62	-2.56	157.36	-38.80			0.89	35.9	0.05
		(32.78)	(-5.23)	(-7.111)	(-2.57)	(-8.89)		(-1.94)	(-0.13)	(18.27)	(-1.71)					
2	**2002**	804.72	-45.19	-158.45	-31.59	-64.34		-15.84	-2.42	158.47	-42.56		0.16	0.89	30.8	0.08
		(32.45)	(-4.93)	(-6.97)	(-2.47)	(-8.69)		(-1.86)	(0.12)	(18.72)	(-1.90)		(0.29)			
3	**2001**	905.09	-231.39	-200.54	-39.57	-143.61	-48.78	-24.66	77.13	104.87		-9.83		0.75	15.2	1.73
		(16.71)	(-4.34)	(-4.83)	(-0.84)	(-4.69)	(-1.09)	(-2.35)	(3.21)	(3.09)		(-0.32)				
4	**2001**	950.20	-222.08	-173.40	-7.14	-141.02	-57.22	-14.15	105.30	87.91		-30.92	-0.002	0.82	19.7	1.33
		(20.77)	(-5.37)	(-4.09)	(-0.15)	(-5.29)	(-1.16)	(-1.23)	(3.12)	(3.70)		(-1.21)	(-3.57)			

Source: Aldebaran commodities price lists 2001 and 2002.

Note:

1/ All the F-statistics are significant at 5 percent.

2/ F-statistic that tests for specification error, Ramsey (1969). All the statistics cannot reject the null hypothesis of correct specification.

Table 2b. Hedonic regression analysis - Logarithmic regression

Dependent variable: Shelled groundnut price

Equation	Year	Estimated coefficients and t-statistics												Adjusted	F	Ramsey
		Intercept	Argentina	China	South Africa	Brazil	Sudan	Size	Runner	Blanched	Split	Crop	Stock	R^2	statistic 1/	statistic 2/
5	**2002**	6.70	-0.06	-0.23	-0.04	-0.08		-0.02	-0.01	0.19	-0.06			0.90	27.2	0.02
		(178.72)	(-4.59)	(-6.59)	(-2.32)	(-8.07)		(-1.79)	(-0.20)	(16.72)	(-1.63)					
6	**2002**	6.67	-0.05	-0.22	-0.04	-0.08		-0.02	-0.01	0.19	-0.06		0.01	0.86	23.3	0.05
		(98.29)	(-4.23)	(-6.46)	(-2.20)	(-7.46)		(-1.72)	(-0.20)	(17.58)	(-1.91)		(0.35)			
7	**2001**	6.80	-0.27	-0.24	-0.03	-0.15	-0.03	-0.03	0.10	0.11		-0.02		0.71	12.4	0.05
		(69.87)	(-5.30)	(-3.01)	(-0.53)	(-3.33)	(-0.30)	(-2.61)	(1.31)	(2.64)		(-0.68)				
8	**2001**	7.81	-0.26	-0.20	0.01	-0.15	-0.03	-0.02	0.14	0.08		-0.04	-0.101	0.78	15.7	0.04
		(26.55)	(-5.19)	(-3.49)	(-0.21)	(-5.81)	(-0.50)	(-1.31)	(2.67)	(2.84)		(-1.20)	(-3.27)			

Source: Aldebaran commodities price lists 2001 and 2002.

Note:

1/ All the F-statistics are significant at 5 percent.

2/ F-statistic that tests for specification error, Ramsey (1969). All the statistics cannot reject the null hypothesis of correct specification.

To study the relationship between reliability and price premium we consider a model where a risk neutral importer has to decide the highest price that he is willing to pay for a commodity from a different origin but with the same characteristics as the one that he is currently importing. If the two sources have a different degree of reliability (e.g., they differ in the probability of delivering the commodity according to the terms of the contract), one would expect that the less reliable source would receive the lower price. Namely, its price will be discounted due to its unreliability. Thus, the importer compares his expected profits from both sources and establishes the price difference for the commodity from both sources.

Let us consider an importer specialised in the trade of a specific commodity. He has a transformation function equal to $Q = min\left\{\frac{M}{\lambda}, a_0 L^{a_1}\right\}$, here Q is the commodity sold in the country, M is the commodity purchased abroad, λ is the shrinkage of the imported good if there is any waste (if there is no waste, λ is equal to one, otherwise it is greater than one) and $a_0 L^{a_1}$ epresents the other inputs required for the import, which we will assume to be labour. a_0 and a_1 are positive parameters, with a_1 between zero and one.

Let P^S be the domestic price at which the importer sells the commodity and P^W the price the importer pays for the commodity provided by the reliable supplier (exporter). Given the prices and the transformation function, the importer will sell the optimal amount Q^* that maximises his profits, where π are profits and m is the labour price.

$$\underset{Q}{Max} \quad \pi = P^S \cdot Q - m \cdot \left(\frac{Q}{a_0}\right)^{\frac{1}{a_1}} - P^W \cdot \lambda \cdot Q \qquad (2)$$

The solution of (2) yields an expression for the maximum profit π:

$$\pi\left[P^S, P^W, m; a_0, a_1, \lambda\right] = \pi\left[P^W\right] = \left(P^S - \lambda \cdot P^W\right) \cdot Q^* - m \cdot \left(\frac{Q^*}{a_0}\right)^{\frac{1}{a_1}} \qquad (3)$$

Let us consider the case where the importer is approached by another exporter who claims that he can also supply the commodity. However, the importer thinks that this other potential supplier is less reliable and that he will honour the contract with a probability equal to $\omega<1$, while he is assigning a probability of one to his current supplier. He knows that in case the new supplier breaches the contract, he will have to purchase the specific commodity on the spot market at a price equal to $(1+\theta)\cdot P^W$, where θ is the premium paid for buying the commodity on the spot market.

The problem to solve is how much the importer is willing to pay to the new supplier, which he expects may fail the contract with a probability of $(1-\omega)$. Let us assume that the criterion used by the importer to set the price for the commodity provided by the new supplier is by comparing the present value of the profits he makes with his current supplier with the expected present value of the profits he would make with the new one.

Thus, let us assume that the interest rate is equal to r, which gives us a discount rate equal to $\beta = 1/(1+r)$. Thus, the present value of the importer's profits when he purchases from his traditional supplier *T*, V_0^T, is equal to:

$$V_0^T = \sum_{i=0}^{\infty} \beta^i \pi\left[P^W\right] \tag{4}$$

where i is the period of time. The present value of the importer's profits when he purchases from the new supplier, V_0^N is equal to (5):

$$V_0^N = \pi\left[\varphi \cdot P^W\right] + \sum_{i=0}^{\infty} \beta^i \left\{\omega^i \cdot \pi\left[\varphi \cdot P^W\right] + \left(1-\omega^i\right) \cdot \pi\left[\left(1+\theta\right)P^W\right]\right\} \tag{5}$$

where ϕ is a ratio between zero and one with respect to the price of the reliable supplier that gives the maximum price that the importer is willing to pay to the new supplier. Therefore, from equations (4) and (5), the value of ϕ is the one that solves equation (6):

$$\pi\left[\varphi \cdot P^W\right] = \left(1-\beta\omega\right)\left\{\left(\frac{1}{1-\beta}\right) \cdot \pi\left[P^W\right] - \left(\frac{\beta\left(1-\omega\right)}{1-\beta\left(1-\omega\right)}\right) \cdot \pi\left[\left(1+\theta\right) \cdot P^W\right]\right\} \tag{6}$$

Important parameters in equation (6) are ω and θ, namely the probability of honouring the contract and respectively the premium paid in the spot market to obtain the commodity in a hurry. Their effect on the premium paid by the importer is considered in expressions (7) and (8).

$$\frac{\partial\varphi}{\partial\omega} = -\frac{\beta\left\{\left(\frac{\pi\left[P^W\right]}{1-\beta}\right) - \left(\frac{\beta\left(1-\omega\right)\pi\left[\left(1+\theta\right) \cdot P^W\right]}{1-\beta\left(1-\omega\right)}\right)\right\} + \frac{\beta\left(1-\beta\omega\right)}{1-\beta\left(1-\omega\right)}\left\{1 + \frac{\beta\left(1-\omega\right)}{1-\beta\left(1-\omega\right)}\right\}\pi\left[\left(1+\theta\right) \cdot P^W\right]}{\frac{\partial\pi\left[\varphi \cdot P^W\right]}{\partial\varphi}} > 0 \tag{7}$$

$$\frac{\partial\varphi}{\partial\theta} = -\frac{\frac{\partial\pi\left[\left(1+\theta\right) \cdot P^W\right]}{\partial\theta}}{\frac{\partial\pi\left[\varphi \cdot P^W\right]}{\partial\varphi}} < 0 \tag{8}$$

The signs of these expressions are unambiguous and the lower the probability ω the lower the price the importer would be willing to pay for the new exporter's product. As regards θ, the greater its value the lower the price the importer would be willing to pay for the commodity provided by the new supplier. It is important to note that the probability assigned by the importer to the reliability of the exporter is subjective - in con-

trast with the premium paid in the spot market - and therefore a number of elements can have influence on its value, such as opinions of other importers, previous experiences when importing from the country or from the specific exporter, or his/her knowledge about the exporter country's productive situation.

Conclusions

Empirical evidence shows that groundnuts' country of origin is an important variable in explaining groundnuts prices, even when taking into account the observable characteristics of the groundnuts marketed. The data show a price premium for the US groundnuts with respect to groundnuts from other origins. However, it is important to remark that due to the lack of appropriate data this is not a test of reliability, since the variable "country of origin", may also give information about issues such as the quality of the country's grading system or uniformity of the shipments.

As secondary information points out that reliability might be an element explaining part of the observed price premiums, we developed a theoretical model (in the absence of statistical evidence for producing an empirical one) to further study the issue. The model is based on a comparison made by an importer of two possible suppliers: one traditional and reliable supplier and a newcomer (possibly from a developing country).

While requiring empirical verification, the implications of the model are interesting, especially for developing countries competing for gaining market access to commodity markets - usually in developed countries' markets - since they suggest that in addition to the observable costs that the importer might incur if the newcomer supplier does not honour the contract, part of the observed price premium might be explained by the importer's perception of the supplier's reliability. Thus, building a reputation for the product may be a slow process consisting not only of producing the right quality but also of modifying the supplier's reputation in the eyes of the importer.

References

Aldebaran Commodities B.V. (2002), Webpage: http://www.aldebaran.nl/, Access: December.

Carley, D. H. and Fletcher, S. M. (1995), "An overview of world groundnut markets", In: *Advances in Peanut Science*, H. Pattee and H. Thomas Stalker (eds.) American Peanut Research and Education Society, Inc., Oklahoma.

Carrex International Ltd. (2002), Webpage: http://www.carrexint.co.uk, Access: December.

Chamberlin, E. H., (1965), *The Theory of Monopolistic Competition*, Eighth edition, Harvard University Press, Massachussets.

Combris, P., Lecocq, S., and Visser, M. (1997), "Estimation of a hedonic price equation for Bordeaux wine: Does quality matter?", *Economic Journal*, vol. 107, no. 441, pp. 390-402.

Falvey, R. E. (1989), "Trade, quality reputations and commercial policy", *International Economic Review*, vol. 30, no. 3, pp. 607-622.

Ramsey, J. B. (1969), "Tests for Specification Errors in Classical Linear Least Squares Regression Analysis", *Journal of the Royal Statistical Society, Series B*, vol. 31, pp. 350-371.

Shapiro, C. (1983), "Premiums for high quality products as returns to reputation", *The Quarterly Journal of Economics*, vol. 98, no. 4, pp. 659-80.

Stiglitz, J. E., (1987) "The causes and consequences of the dependence of quality on prices", *Journal of Economic Literature*, vol. 25, pp. 1-48.