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Modelling information and hedging: the exporting firm

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Modelling information and hedging: the exporting firm

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Abstract:

The paper examines the economic role of modelling information on the decision problem of an exporting firm under exchange rate risk and hedging. Information is described in terms of market transparency, i.e., a publicly observable signal conveys more information about the random foreign exchange rate. We analyze the interaction between market transparency and the ex ante expected utility of the exporting firm. It is shown that more transparency on the foreign exchange market may result in higher or lower export production.

JEL-Classification: D81, D83, F11, F31

Keywords: Information, transparency, exchange rate risk, hedging, trade.

1. Introduction

The uncertainty to which decision makers are exposed in a global economy depends on the amount and the precision of information available to them. More reliable information, e.g. about exchange rates, interest rates, prices, technology, or market conditions, allows market participants to make better decisions. When the information is of public nature, rather than privately owned by the individual, it will be used by other agents, too. Under such circumstances the information may affect endogenous market mechanisms (Burnside et al. (2001)).

The precision of information revealed to agents through an information system has recently been conceptually linked to the notion of market transparency. The policy oriented literature stresses the role of transparency for a functioning economy. This paper suggests a different notion of transparency for the financial market and analyzes its role for the decision problem of an exporting firm under exchange rate uncertainty. The risk averse exporting firm has access to a currency futures market where it can hedge its net exposure connected with its export (see, for example, Broll et al. (1999), Wong (2003)). Prices and contracts traded on the currency forward market depend upon market transparency.

In our study the market transparency is linked to the informativeness of a publicly observable signal which is correlated with the random foreign exchange rate. The signal conveys some noisy information about the unknown exchange rate and, therefore, allows the firm to update its beliefs. The uncertainty to which the exporting firm is exposed when it decides about resource allocation for production depends on the observed signal as well as on the information system within which the signal can be interpreted. We characterize the foreign exchange market as more transparent if the signal conveys more precise information about the unknown foreign exchange rate. Thus, more information means that the exchange rate uncertainty is reduced through the disclosure of more reliable information.

In the literature there are mainly three analytical concepts measuring the degree of information and proposing an order of the underlying information systems. They were proposed by Blackwell (1953), Lehmann (1988), and Kim (1995). The notion of transparency used in our study is adopted from the work by Drees and

Eckwert (2003). They characterize market transparency by using a criterion which is conceptually related to the literature that emerged from the seminal works by Blackwell (1953). For other concepts of transparency that have been used in the economic literature, see Heinemann and Illing (2002), Krebs (2005).

There is a large body of related literature which analyzes the welfare effects of public information. When individuals make decisions in isloation from others, more reliable information is generally beneficial (Blackwell (1953)). Yet, more information can have detrimental effects if the information affects risk sharing arrangements in the economy (Hirshleifer (1971), (1975), Schlee (2001)) or if agents interact strategically using private information and public information simultaneously (e.g. Morris and Shin (2002)). In this paper we abstract from informational asymmetries but we allow for some risk sharing through a competitive futures market. While market transparency does not affect the risk premium on this market, it does have implications for the amount of risks that will be shared in equilibrium.

We demonstrate that the impact of more precise information on the exporter's ex ante expected utility depends on the degree of risk aversion and on the firm's technology. In particular, more transparency reduces the exporter's ex ante expected utility, if the firm is highly risk averse and if marginal productivity is decreasing rapidly. The exporting firm benefits from more transparency on the foreign exchange market if it is moderately risk averse and/or marginal productivity is slowly decreasing. We find that more transparency may increase or decrease the export production of the firm. The impact depends on the exporter's technology. It is also shown that more transparency may result in less average output even though on average more resources, i.e. labor, has been used in the production process.

The rest of the paper is organized as follows. Section 2 develops a two period model of the exporting firm's decision problem. We introduce the concept of market transparency which underlies the analysis. Section 3 derives the main results. The final section concludes.

2. The model: export, hedging and information

We consider the model of a competitive risk averse exporting firm which extends over two periods, $t = 0, 1$. The firm employs labor, L, as an input factor for the production of a homogenous good in period 0 and sells its product at a given world price in foreign currency p per unit. The wage rate, w, is given. The foreign exchange rate $\tilde{e}$ is random in $t = 0$. The tilde refers to the stochastic nature of the exchange rate which assumes values in $\Omega = [\underline{e}, \overline{e}]$, where $0 < \underline{e} < \overline{e} < \infty$. The production technology of the firm is described by a strictly concave function $F(L)$ with $F'(L) > 0, F''(L) < 0$. The firm has access to a currency forward market where it can hedge the spot exchange rate risk.

Prior to the firm's decision on employment and hedging a publicly observable signal s is realized. This signal is the realization of a random variable $\tilde{s}$ which is correlated with the foreign spot exchange rate $\tilde{e}$. Hence, the signal s contains information about the unknown foreign exchange rate and, at the time when the firm chooses labor input for export production, the relevant expectation for $\tilde{e}$ is the updated (in a Bayesian way) posterior belief.

The currency forward market opens at date 0 after the signal has been observed. In this market futures contracts are traded each of which involves the obligation on the part of the seller to deliver e units of domestic currency to the buyer at date 1 if the exchange rate turns out to be e. Let H denote the number of futures contracts sold by the firm. We assume that the futures market is unbiased, which implies that the futures market clears at a price $e_f(s)$, that is equal to the conditional mean of a contract's payoff, i.e. $e_f(s) = E[\tilde{e}|s]$. Both the purchase price and the payoff of a futures contract fall due at time 1. The production decision is made after the signal has been observed, but before the foreign exchange rate is known. Therefore, the firm is subject to economic risk.

In order to hedge the risk exposure, the firm sells (buys) H units of the currency forward on the futures market. The random operating profit of the firm is $\tilde{\Pi} = \tilde{e}pF(L) - wL - (\tilde{e} - e_f(s))H$ and the firm's decision problem reads

$$\max_{L,\,H} E[U(\tilde{\Pi})|s],$$

where U is a strictly increasing, strictly concave and twice continuously differentiable utility function. The firm maximizes the expected utility with respect to labor input, L, and future commitment H. The necessary and sufficient first order conditions are

$$\begin{aligned} E\big[U'(\tilde{\Pi}^*)\big(\tilde{e}pF'(L^*) - w\big)|s\big] &= 0, \\ E\big[U'(\tilde{\Pi}^*)\big(e_f(s) - \tilde{e}\big)|s\big] &= 0. \end{aligned}$$

From these two equations we obtain the optimal level of labor input, L^*, and the optimal forward commitment, H^*, as

$$e_f(s)pF'(L^*) = w \quad \text{and} \quad H^* = pF(L^*).$$

This implies that the optimal level of labor demand, L^*, is an increasing function of $e_f(s)$. Due to unbiasedness of the futures market risks are fully hedged and, consequently, the exporter's profit is certain: $\Pi = e_f(s)pF(L^*) - wL^*$.

We identify the transparency of the financial market with the informativeness of the signal $s \in S \subset \mathbb{R}$, which is publicly observable. The informativeness of the signal depends on the information system within which signals can be interpreted. An information system, denoted by g, specifies for each state of nature, e, a conditional probability function over the set of signals: $g(s|e)$. The positive real number $g(s|e)$ defines the conditional probability that the signal s will be observed if the true exchange rate is e. The function $g(s|e)$ is common knowledge. Using Bayes's rule, the firm revises its expectations and maximizes expected utility on the basis of the updated beliefs.

Let $\pi : \Omega \to \mathbb{R}_+$ be the density function for the prior distribution over Ω. The density for the prior distribution over signals in S is given by

$$\nu(s) = \int_\Omega g(s|e)\pi(e)\,\mathrm{d}e \quad \text{for all } s.$$

The density function for the updated posterior distribution over Ω is

$$\nu(e|s) = g(s|e)\pi(e)/\nu(s).$$

Blackwell (1953) suggested a criterion that ranks different information systems according to their informational contents. Suppose g^1 and g^2 are two information

systems with associated density functions $\nu^1(\cdot)$ and $\nu^2(\cdot)$. The following criterion induces an ordering on the set of information systems.

Definition Let g^1 and g^2 be two information systems. Information system g^1 is said to be more informative than information system g^2 (expressed by $g^1 \succ_{\text{inf}} g^2$), if there exists an integrable function $\lambda : S^2 \to \mathbb{R}_+$ such that

$$\int_S \lambda(s', s)\, ds' = 1,$$

for all $s \in S$, and

$$g^2(s'|e) = \int_S g^1(s|e)\lambda(s', s)\, ds$$

for all $e \in \Omega$.

According to this criterion, $g^1 \succ_{\text{inf}} g^2$ holds if g^2 can be obtained from g^1 through a process of randomization. The probability density $\lambda(s', s)$ transforms a signal s into a new signal s'. If the s' values are generated in this way, the information system g^2 can be interpreted as being obtained from the information system g^1 by adding random noise. Note that $\lambda(\cdot, \cdot)$ is independent of e. Therefore, the signals under information system g^2 convey no information about the value of $\tilde{e}$ that is not also conveyed by the signals under information system g^1.

Our notion of transparency in the foreign exchange market is based on the informational content of the signal. A signal that conveys information about the random spot exchange rate affects the conditional exchange rate uncertainty in the economy. This conditional uncertainty may be hedged (partially or fully) by an economic agent if risk sharing arrangements are available. Less conditional uncertainty due to better information therefore does not necessarily imply that the agent is exposed to less risk. In our model, for example, the firm eliminates any conditional exchange rate risk from its profits through trade on the currency forward market regardless of the signal's precision. We characterize the foreign exchange market as more transparent if the signal, s, conveys more reliable information about $\tilde{e}$. Thus, higher market transparency implies that the conditional exchange rate uncertainty is reduced through the dissemination of more precise information. The following Lemma 1 contains a property of information systems which can be used in our analysis.

Lemma 1 Let g^1 and g^2 be two information systems for the random exchange rate $\tilde{e}$. The foreign exchange market is more transparent under g^1 than under g^2 if and only if

$$\int_S G\big(\nu^1(\cdot|s)\big)\nu^1(s)\,ds \geq \int_S G\big(\nu^2(\cdot|s)\big)\nu^2(s)\,ds$$

holds for every convex function $G(\cdot)$ on the set of density functions over Ω. Note $\nu^1(\cdot|s)$ and $\nu^2(\cdot|s)$ are the posterior beliefs under the two information systems.

Lemma 1 implies that more transparency (weakly) raises the expectation of any convex function of posterior beliefs. For concave functions the inequality is reversed. A proof of Lemma 1 is developed in Kihlstrom (1984). In the next section we will apply this property to examine the exporting firm's decision when there is more transparency in the foreign exchange market.

3. Transparency, ex ante expected utility and export

What are the implications of more reliable information for the ex ante expected utility of the exporting firm? We define for any realization of the signal s the value function $\hat{U}\big(e_f(s)\big)$ as the firm's conditionally expected utility

$$\hat{U}\big(e_f(s)\big) = U\Big(e_f(s)F\big(L^*(e_f(s))\big) - wL^*\big(e_f(s)\big)\Big),$$

where the deterministic world price, p, is set equal to one. Our analysis focuses on the ex ante expected utility of the exporting firm prior to the realization of the signal, i.e. $E\big[\hat{U}\big(e_f(\tilde{s})\big)\big]$. Since $e_f(s)$ is linear in the posterior state probabilities, Lemma 1 implies

Proposition 1 More transparency on the foreign exchange market increases (decreases) ex ante expected utility of the exporting firm, if $\hat{U}(e_f)$ is convex (concave).

In order to link the implications of transparency on ex ante expected utility we analyze under which conditions the value function $\hat{U}(e_f)$ is convex or concave. Differentiating the value function and using the envelope theorem yields

$$\alpha \cdot \frac{\partial^2 \hat{U}(e_f)}{\partial e_f^2} = \frac{U''(\Pi^*)}{U'(\Pi^*)} - \frac{(F'(L^*)/F(L^*))^2}{e_f F''(L^*)},$$

where $\alpha = 1/U'(\Pi^*)F(L^*)^2 > 0$. The first term on the RHS is negative due to risk aversion of the firm. The second term is positive since the technology is concave.

The negative first term (Hirshleifer effect) captures the ex ante expected utility losses that result from the reduction of risk hedging opportunities: the currency futures market allows the firm to hedge against that part of the exchange rate risk that has not yet been resolved by the signal; i.e. the more informative the signal is the smaller is the portion of risk that can be hedged through forward contracts. Since the exporter is risk averse, this effect reduces the ex ante expected utility of the firm. The loss in ex ante expected utility is larger if the firm is more risk averse.

The second term (Blackwell effect) represents the increase in ex ante expected utility that results from the fact that the firm can make a better decision when it acts in a more transparent market environment. This effect depends on the concavity of the production function: the Blackwell effect is weak if F'' is large in absolute value, i.e., if marginal productivity declines quickly. And the Blackwell effect is strong, if marginal productivity declines slowly. The consequence for ex ante expected utility of more transparency on the exchange market are determined by the interaction of the Blackwell effect and the Hirshleifer effect. If the firm is highly risk averse and if the marginal productivity declines quickly, the Hirshleifer effect dominates the Blackwell effect and, hence, more transparency is undesirable from the perspective of the firm. By contrast, if the firm is moderately risk averse, or even risk neutral, and/or the marginal productivity decreases slowly, the Blackwell effect is dominant. In this case the firm benefits from more market transparency. For further discussions of these effects in different economic settings, see Schlee (2001), Eckwert and Zilcha (2001), (2003).

It is worth pointing out that the (negative) Hirschleifer effect rests on the availability of risk sharing instruments on the foreign exchange market. In the absence of risk sharing arrangements, or if risk sharing is possible only at inordinately high costs, the Hirshleifer effect is absent or negligible and, hence, in this case transparency has more favorable implications than in our analysis. It is also worth mentioning that in more general settings than the one used here higher transparency may reduce the distortionary effects of moral hazard and adverse selection phenom-

ena thereby enhancing overall economic welfare.

Next we analyze the interaction between employment, output for exports and transparency of the foreign exchange market. Denoting by $E(L)$ the ex ante expected level of employment, we get

$$E(L) = \int_S L^*\big(e_f(s)\big)\nu(s)\,\mathrm{d}s.$$

where $L^*(e_f(s))$ denotes labor demand in the optimum. We characterize the interaction between the expected level of labor employed and market transparency as follows.

Proposition 2 More transparency in the foreign exchange market leads to higher (lower) ex ante expected employment, if

$$-[F'(L)]^2/F''(L)$$

is monotone increasing (decreasing) in L in the relevant range.

Proof Referring to Lemma 1 and noting that $e_f(s)$ is linear in the posterior belief $\nu(\cdot|s)$, we need to show that under the condition of the proposition $L^*(e_f)$ is a convex (concave) function. From differentiation of the first order condition we obtain

$$L^{*\prime}(e_f) = -\frac{F'\big(L^*(e_f)\big)}{e_f F''\big(L^*(e_f)\big)} = -\big[F'\big(L^*(e_f)\big)\big]^2/F''\big(L^*(e_f)\big)w > 0.$$

Thus, $L^{*\prime}(e_f)$ is an increasing (decreasing) function if

$$-\big[F'(L)\big]^2/F''(L)$$

is monotone increasing (decreasing) in L in the relevant range. q.e.d.

According to Proposition 2, more transparency *reduces* the ex ante expected level of employment if F'' is constant. If, in addition, the constant F'' is small in absolute value, more transparency will lead to higher ex ante expected utility. By contrast, if F'' is large, then ex ante expected utility will decline with more transparency. This shows that, depending mainly on the production technology, there may exist a positive or negative transparency-induced link between ex ante expected utility and the ex ante expected employment level.

Finally we analyze the impact of foreign exchange market transparency on the expected export volume

$$E(F) = \int_S F\big(L^*(e_f(s))\big)\nu(s)\,\mathrm{d}s.$$

More transparency may either stimulate or reduce the average export volume of the firm. Which case applies depends on the firm's production technology $F(L)$.

Proposition 3 More transparency in the foreign exchange market leads to higher (lower) ex ante expected exports, if

$$-\big[F'(L)\big]^3/F''(L).$$

is increasing (decreasing) in L on the relevant range.

Proof By differentiation of the first order condition we get

$$\frac{\partial}{\partial e_f}\big[F(L^*(e_f))\big] = -\big[F'(L^*(e_f))\big]^3/F''\big(L^*(e_f)\big)w.$$

This implies that, under the condition of the proposition, $F\big(L^*(e_f)\big)$ is convex (concave) in e_f. The claim then follows from Lemma 1. q.e.d.

Depending on the production technology, the ex ante expected export volume may either increase or decrease. In particular, our analysis does not confirm the conjecture that more transparency in foreign exchange market necessarily promotes export activity. It may even happen that the average employment level increases with more transparency while, at the same time, average export production declines. With more transparency, good signals lead to an additional increase in employment and export production while bad signals cause an additional decline in employment and output. However, the additional employment of labor at times when good signals are observed has low marginal productivity because the production technology is concave. The increase in output is small. At times when bad signals are observed labor has high marginal productivity. The decline in labor employment therefore causes a large reduction in output. Thus, under a better information system more labor will be employed when marginal productivity of labor is low, and less labor will be employed when marginal productivity is high. This mechanism, which is

strong if marginal productivity decreases quickly, may result in less ex ante expected output under a more transparent system even though on average more labor has been used in the production process.

In the special case where F'' is constant the levels of ex ante expected employment and export production always move in the same direction as the degree of transparency on the foreign exchange market changes. This follows immediately as a corollary from Proposition 2 and 3. Our earlier discussion of the transparency-induced link between ex ante expected utility and ex ante expected employment therefore generalizes in an obvious way: the discussion also applies to the link between ex ante expected utility and export production.

Under a more transparent system labor employment and production become more volatile because they react more sensitively to changes in the signal. This is because with more reliable signals the distribution of the forward rate $e_f(s)$ becomes more spread out: the futures price combines the realization of the signal, s, with the prior of $\tilde{e}$, and it assigns more weight to the signal if the signal contains more reliable information about the exchange rate $\tilde{e}$. Therefore, a more reliable signal leads to a futures price which is more dispersed as it is more sensitive to the realization of the signal. Since employment and output decisions depend on the futures price they become more dispersed, too.

4. Conclusions

This paper has suggested a theoretical framework for modelling information and transparency in an open economy. Market transparency is at the center of the current regulatory debate. We have modelled market transparency through the precision of information signals correlated to an unknown future exchange rate. The aim of our study is to discuss the economic implications of more transparency in the foreign exchange market. As a main result of our analysis, we have shown that under a more transparent system the ex ante expected utility of an exporting firm may increase or decrease depending on the interaction between technological effects and risk sharing effects. Furthermore we have derived conditions under which higher transparency increases or decreases the ex ante expected level of employ-

ment and export production. Under special circumstances there exists an inverse transparency-induced link between the ex ante expected levels of employment and production.

References

Blackwell, D., 1953. Equivalent comparison of experiments. Annals of Mathematics and Statistics 24, 265-272.

Broll,U., Wong, K.P., Zilcha, I., 1999. Multiple currency and hedging. Economica 66, 421-432.

Burnside, C., Eichenbaum, M., Rebelo, S., 2001. Hedging and financial fragility in fixed exchange rate regimes. Journal of International Economics 45, 1151-1193.

Drees, B., Eckwert, B., 2003. Welfare effects of transparency in foreign exchange markets: the role of hedging opportunities. Review of International Economics 11, 454-463.

Eckwert, B., Zilcha, I., 2001. The value of information in production economies. Journal of Economic Theory 100, 172-186.

Eckwert, B., Zilcha, I., 2003. Incomplete risk sharing arrangements and the value of information. Economic Theory 21, 43-58.

Heinemann, F., Illing, G., 2002. Speculative attacks: unique equilibrium and transparency. Journal of International Economics 58, 429-450.

Hirshleifer, J., 1971. The private and social value of information and the reward to incentive activity. American Economic Review 61, 561-574.

Hirshleifer, J., 1975. Speculation and equilibrium: information, risk and markets. Quarterly Journal of Economics 89, 519-542.

Kihlstrom, R.E., 1984. A Bayesian exposition of Blackwell's theorem on the comparison of experiments. In: M. Boyer and R.E. Kihlstrom (eds), Bayesian models of economic theory, Elsevier, 13-31.

Kim, S.K., 1995. Efficiency of an information system in an agency model. Econometrica 63, 809-102.

Krebs, T., 2005. Fundamentals, information, and international capital flows: a welfare analysis. European Economic Review 49, 579-598.

Lehmann, E.L., 1988. Comparing location experiments. Annals of Statistics 16, 521-533.

Morris, S., Shin, H.S., 2002. Social value of public information. American Economic Review 92, 1521-1534.

Schlee, E., 2001. The value of information in efficient risk sharing arrangements. American Economic Review 91, 509-524.

Wong, K.P., 2003. Export flexibility and currency hedging. International Economic Review 44, 1295-1298.

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