Optimism, Pessimism, and the Gains from Trade

Blanchard, Michel and Blanchard, Frederic

Inalco, EURIsCO-Université Paris dauphine, Université Paris dauphine-Eurisco

18 December 2007

Optimism, pessimism and the gains from trade

M. Blanchard and F. Peltrault

EURIsCO, INALCO and EURIsCO, University of Paris Dauphine

Place du Maréchal de Lattre de Tassigny, 75775 Paris cedex 16

Corresponding Author: Frederic Peltrault, Département Economie Appliquée, University of Paris Dauphine, Place du Maréchal de Lattre de Tassigny, 75775 Paris Cedex 16 . France

Phone: 33(1) 44054710

Fax: 33(1) 44054892

Email: frederic.peltrault@dauphine.fr

Optimism, pessimism and the gains from trade

Section 1. Introduction

Since the end of the 1970s, new models of choice under uncertainty have been developed which generalize the classic Expected Utility Theory of von Neumann-Morgensten. Among these, Rank Dependent Expected Utility (RDEU) theory, first proposed by Quiggin (1982), has been applied to a diverse range of topics, mainly concerning finance and insurance theory[1]. In this paper, we suggest a new application of RDEU theory in re-examining the gains from trade debate under uncertainty.

At least since Brainard and Cooper (1968), international economists have been interested in the welfare impact of international trade in the presence of uncertainty. For instance, using the traditional expected utility framework, Newbery and Stiglitz (1981), Grossman (1984) and Shy (1988) describe an economy in which risk-averse managers have to choose between a certain project and a risky one. In this standard analysis of decision-making under risk, international trade depends crucially on the absence of hedging instruments (e.g. an insurance market). Under the assumption of complete markets, there is no international trade.

The Dual Theory of choice under risk developed by Yaari (1987) is a special case of RDEU theory which reflects individuals' "optimism" and "pessimism" with respect to probabilities. This Dual Theory has well-documented empirical foundations and important theoretical implications.

As shown by Kahneman and Tversky (1979), the linearity in probabilities assumed by the expected utility framework is inconsistent with empirical studies of human behaviour: people

[1] See Starmer (2000) for a survey.

seem to have different attitudes towards small probabilities and large probabilities. Rank Dependent Excepted Utility models like that of Yaari (1987) take this behaviour into account, as probabilities are distorted by individuals. In addition, the specific misperception of risk by entrepreneurs has been documented by Cooper, Woo and Dunkerberg (1988), who show that entrepreneurs in the United States are rather optimistic: 80% of American entrepreneurs foresee a probability of success of over 70%, whereas numerous studies suggest that less than 50% of businesses survive for more than five years.

The Dual Theory also has marked theoretical implications for Pareto allocations. According to Hammond (1981), "when managers misperceive probabilities bond markets also give them too much scope for bad decisions". For instance, Doherty and Eeckhoudt (1995) show that (in the Dual Theory framework) it is not possible to reach an optimum with a perfect insurance market *ex-post* since some managers will choose not to insure themselves against risk. When decision making is modeled under RDEU, it does not matter whether markets are complete or not: the hedging of risk is imperfect. In the context of international trade under uncertainty when decision making is modelled under RDEU, we might expect that trade will still take place even when there are complete markets. This is an interesting implication of RDEU theory.

Another motivation of this paper is to show that manager heterogeneity matters when considering the welfare effects of international trade under uncertainty. We extend Blanchard and Peltrault (2004) by introducing, in each country, a continuum of managers who are heterogeneous with respect to their degree of optimism over the probability of success. This heterogeneity assumption receives empirical support in Cooper *et al*. (1988): some entrepreneurs are pessimistic (e.g. 1% foresee a probability of success of 10%) while some are optimistic (e.g. 33% foresee a probability of success of 100%). Firm heterogeneity has become an important assumption in the international trade literature. In particular, a growing

number of papers have analysed how international trade can induce reallocations of resources among heterogeneous firms within an industry (Jean, 2002, Bernard, Eaton, Jensen and Kortum, 2003, Melitz, 2003, Bernard, Redding and Schott, 2004, and Falvey, Greenaway and Yu, 2004). When firms are heterogeneous over productivity, comparative advantage can be based on international differences in the distribution of productivity.

In this paper, comparative advantage between countries is based on differences in risk perception. Even though there are both optimistic and pessimistic managers in both countries, it seems reasonable to assume that one country may be overall more pessimistic than the other. Along these lines, Hofstede (2001) emphasizes that countries are heterogeneous with respect to uncertainty-avoidance[2]. The relatively more optimistic country will then export the risky commodity and import the certain commodity.

The key assumptions of our paper, distortion of probabilities and manager heterogeneity, have direct consequences on the gains from trade debate. On the one hand, when managers distort probabilities, contrary to the case of traditional expected utility theory, two welfare criteria are needed. As shown by Hammond (1981), welfare has to be measured both before (*ex-ante* welfare) and after (*ex-post* welfare) the resolution of uncertainty, as *ex-ante* efficiency loses its normative appeal and *ex-post* efficiency becomes interesting. In addition, *ex-post-ex-ante* consistency is no longer ensured when managers are heterogeneous regarding their subjective probabilities[3]. We thus reconsider the gains from trade debate from the *ex-ante* point of view, as in previous international trade literature, but also from the *ex-post* point of view. This methodology challenges traditional perceptions of trade policy since a country may regret a commitment to free trade or protectionism when political decisions are based on *ex-ante* welfare analysis. On the other hand, manager heterogeneity implies that there are both *ex-ante* winners and losers from free trade in each country. However, there does not always exist a

[2] For instance, the level of uncertainty-avoidance is twice as high in Japan as in the United States.
[3] See Blackorby, Donaldson and Mongin (2004).

feasible compensation scheme that could guarantee Pareto welfare improvement within countries, at least for the more pessimistic country. Hence, manager heterogeneity matters since *ex-ante* welfare never falls with trade openness when managers are identical within countries. Moreover, numerical simulations show that *ex-ante* and *ex-post* analysis can lead to opposing policy recommendations for some parameter values. A country may be better off *ex-ante* but worse off *ex-post* and *vice versa*.

The remainder of the paper is organized as follows. Section 2 describes the structure of the model, and Section 3 analyses the autarky equilibrium. Section 4 considers the free trade equilibrium, and Section 5 analyses the effect of free trade on *ex-ante* welfare. Section 6 provides the *ex-post* welfare analysis and economic policy implications. Section 7 concludes.

Section 2. The model

Consider a country J in which a continuum of managers, indexed on the interval $[0,1]$, choose one of two production projects C and R. Project C is certain and provides one unit of commodity C and a wage w_c. Project R is risky, providing one unit of commodity R and a wage w_r with probability θ, and 0 with probability $1-\theta$. Risk is idiosyncratic to each manager's project rather than global. Hence, aggregate uncertainty is cancelled by application of the law of large numbers[4].

2.1. The psychology of managers

INSERT FIGURE 1.

As illustrated in Figure 1, the cognitive process and the choice process can affect the actual end probability. First, a manager may have difficulty in evaluating the actual risk due to

[4] As proved by Judd (1985), there are some difficulties with the application of the law of large numbers in a continuum. However, we follow here the tradition of the economic literature which explicitly or implicitly

cognitive problems. When the perceived probability is higher than the objective probability ($\hat{\theta} > \theta$) a manager is optimistic about the chances of success (conversely for a pessimistic manager). Strictly speaking, this optimism or pessimism is not psychological but cognitive: better information would lead the manager to revise the anticipated probability closer to θ. In this paper, there are neither information nor cognitive problems since we assume that each manager knows the objective probability of success (so that $\hat{\theta} = \theta$). We therefore focus on the choice process to shed some light on the psychology of managers faced with risk, in the spirit of Yaari (1987). The psychology of managers is introduced into the choice process via a distortion function $g(\hat{\theta})$. When the distortion function $g(\hat{\theta})$ is concave (convex), a manager is optimistic (pessimistic). According to Yaari, pessimistic (optimistic) behaviour is synonymous with risk-aversion (seeking) in the Dual Theory.

Consequently, each manager $i \in [0,1]$ may think that his own chances of success, denoted by $g_\theta(i)$, are different from the common knowledge objective probability. As Cooper, Woo & Dunkerberg (1988) note, "the assessment by entrepreneurs of their own likelihood of success is dramatically detached from past macro statistics, from perceived prospects for peer businesses, and from characteristics typically associated with higher performing new firms." This assessment is psychological, and relies on self-confidence and not on cognitive difficulties. This explains why distorted probabilities tend to persist, since people are reluctant to take into consideration ego-threatening information in order to maintain their self-esteem. This phenomenon is well known amongst psychologists (Ross and Anderson, 1982) and can also be rationally grounded (Carillo and Mariotti, 2000, Benabou and Tirole, 2002, and Van der Steen, 2004). Bayesian revision is thus irrelevant in this context. We consequently assume that managers do not revise their distorted probabilities.

---

avoids this difficulty. See the seminal contributions of Diamond and Dybvig (1983) or Lucas and Prescott

2.2 The decision rule

As noted above, the Dual Theory of choice under risk developed by Yaari (1987) is a useful tool for translating managers' perceived risk into production choices. This theory is dual to expected utility theory as the roles of wealth and probabilities are reversed: utility is linear in wealth but non-linear in probabilities. In expected utility theory, risk aversion is synonymous with diminishing marginal utility of wealth. On the contrary, in the Dual Theory attitudes towards wealth do not affect attitudes towards risk since they appear separately. The linearity of the utility function in wealth then allows us to sidestep wealth effects and focus on attitudes towards risk.

Consider a gamble L with two outcomes valued at $(\overline{x}, \underline{x})$ with respective objective probabilities $(\theta, 1-\theta)$.

Following Yaari, the utility function of manager *i* becomes:

$$\Omega_i(L) = [1 - g_i(\theta)]\underline{x} + g_i(\theta)\overline{x},$$

where $g_i(\theta)$ denotes the processing function of probabilities of manager *i*. Note that $g_i(\theta)$ is monotonously increasing in θ with $g_i(0) = 0$ and $g_i(1) = 1$. Then a manager is optimistic (pessimistic) when $g_i(\theta)$ is concave (convex).

In our model, each manager has to choose between a certain project and a risky project, which provides wage w_r with probability θ and 0 with probability 1-θ. With the distorted probability $g_i(\theta)$, the prospect of the risky project R for manager *i* is:

$$\Omega_i(R) = [1 - g_i(\theta)] \times 0 + g_i(\theta) \times w_r.$$

The Dual Theory of choice under risk implies that managers invest all of their time in the management of their one production project. The linearity of utility in wealth produces corner

---

(1974).

solutions in optimization problems: the Dual Theory predicts "plunging" rather than diversification between safe and risky projects. As Yaari notes (p.110), "Under the Dual Theory, the behavior of such an agent, can be described, so to speak, as waiting in the wings until the rate of return is high enough, and then going whole hog".

This "plunging" behavior is consistent with Moskowitz and Vissing-Jørgensen (2002) who note that entrepreneurs show a dramatic lack of diversification and extreme dispersion in returns. Choice is thus exclusive and we have the following decision rule.

Decision rule: A manager $i \in [0,1]$ chooses the risky project if and only if:

$$\Omega_i(R) > \Omega_i(C) \Leftrightarrow g_i(\theta) \times w_r > w_c \qquad (1)$$

The level of entrepreneurship in the economy then depends on both the distribution function of the distorted probabilities and on the two wages.

2.3. Modelling manager heterogeneity

We assume managers are heterogeneous since they distort a probability θ according to their idiosyncratic distortion function $g_i(\theta)$. Define $g_\theta(i)$ the value of the distorted probability of manager *i* for one given θ. Then managers can be ranked over the continuum $[0,1]$ according to their distorted probability $g_\theta(i)$ and their degree of optimism $\delta_\theta(i)$, where $\delta_\theta(i)=\Psi_\theta(i)=\frac{g_\theta(i)}{\theta}$. As illustrated in figure 2a, the cross-section for a given θ gives the distribution function of distorted probabilities $g_\theta(i)$ depicted in figure 2b. Then, we obtain $\delta_\theta(i)=\Psi_\theta(i)=\frac{g_\theta(i)}{\theta}$ the distribution of the degree of optimism of managers.

INSERT FIGURES 2a AND 2b

Then, a manager *i* is optimistic if $\Psi_\theta(i) > 1$. For convenience, we will drop the subscript θ.

Ψ is strictly increasing and continuous on the interval $[0,1]$. $\bar{\delta}$ (resp. $\underline{\delta}$) refers to the degree of optimism of the most (least) optimistic manager: $\bar{\delta} = \Psi(0)$ and $\underline{\delta} = \Psi(1)$.

For example, define the distribution function of distorted probabilities as follows: $g(i) = \theta^{\beta+i}$ with $\beta \in \left[0, \frac{1}{\theta}\right]$. As illustrated in Figure 2b, the population of managers can be broken down into two groups: optimistic managers and pessimistic managers.

- managers are optimistic for $i \in [0, 1-\beta[$, $g(i) > \theta$ and $\Psi(i) > 1$
- managers are pessimistic for $i \in]1-\beta, 1]$, $g(i) < \theta$ and $\Psi(i) < 1$
- Manager V indexed by $1-\beta$ is confident since $g(1-\beta) = \theta$ and $\Psi(1-\beta) = 1$

Section 3. Autarky

General autarky equilibrium is reached when the risky commodity market clears. At the equilibrium price, the amount of risky commodity demanded by all agents equals the amount supplied (*ex-post*) by managers who have chosen (*ex-ante*) the risky process. Since decisions are made before the resolution of uncertainty, managers have to anticipate the level of earnings associated with each production project. This is possible as long as the distribution function of managers over distorted probabilities is common knowledge.

3.1. The level of entrepreneurship

The level of entrepreneurship in autarky is given by n^a, which is the share of managers involved in the risky project. The manager with index n^a is indifferent between project R and project C. For this marginal manager, the decision rule states that $w_C^a = g(n^a) \times w_R^a$, that is:

$$\delta^a = \Psi(n^a) = \frac{w_C}{\theta w_R} \qquad (2)$$

The degree of optimism δ^a associated with this manager is equal to the objective relative wage. The level of entrepreneurship in autarky then equals n^a as more optimistic managers will choose the risky project:

$$\forall i \in \left[0, n^a\right],\ \Psi(i) \geq \delta^a \ \text{ and } \ \Omega_i(R) > \Omega_i(C). \tag{3}$$

Production of commodity R in autarky is then $y_R^a = \theta n^a$.

3.2. Autarky equilibrium.

Formally, as in Kihlstrom and Laffont (1979), the autarky equilibrium is characterised by a price p for which global supply of the risky commodity is equal to global demand and a marginal manager who is indifferent between the two activities.

The following equations characterise the autarky equilibrium:

$$\Psi(n^a) = \frac{1}{\theta p^a} \tag{4}$$

$$p^a = \frac{b}{(1-b)\times\theta} \times \frac{1-n^a}{n^a} \tag{5}$$

Commodity C is the *numéraire* so that p_J^a refers to the autarky price of commodity R in terms of commodity C. After the resolution of uncertainty, managers involved in the certain activity receive $w_C^a = 1$ while lucky entrepreneurs earn $w_R^a = p^a$. Substituting these expressions into (2) yields equation (4) which embodies the psychological side of the model.

Let d_C and d_R be the demands for commodities C and R respectively. The aggregate demand functions for the two commodities have unitary price and income elasticities, and *b* denotes the share of income devoted to the consumption of commodity R. We then have $d_C = (1-b)y$ and $d_R = by/p$, where *y* is aggregate income with $y^a = (1-n^a) + p^a\theta n^a$. The

relative price of commodity R which equalises global demand and global supply of commodity R is given by equation (5).

From (4) and (5), the level of entrepreneurship in autarky is given by $\Psi(n^a) = \phi(n^a)$ where

$$\phi(n^a) = \frac{1-b}{b} \times \frac{n^a}{1-n^a}.$$

Proof of the existence and uniqueness of this equilibrium level is provided in Appendix A, but a diagram may help to illustrate the properties of the autarky equilibrium.

3.3. Diagrammatic presentation

Figure 3 shows how the functions $\Psi(n^a)$ and $\phi(n^a)$ determine the equilibrium allocation of managers in industry R. The autarky level of entrepreneurship n^a (*i.e.* the ranking of the marginal manager) is at point E^a where $\Psi\Psi$ and $\phi\phi$ intersect. When all managers are confident, like manager V, the line $\Psi\Psi$ is horizontal and the equilibrium level of entrepreneurship is equal to the share of the national income devoted to the consumption of the risky commodity: $n^a = b$. This benchmark helps to characterize the overall psychology of a country.

Definition 1. A country J is globally optimistic if the marginal manager is optimistic ($\delta_J^a > 1$). In other words, a country is optimistic if the equilibrium level of entrepreneurship is higher than b. Otherwise country J is globally pessimistic.

INSERT FIGURE 3

Figure 3 shows the case of a globally pessimistic economy since the production of the risky commodity is less than b. The production choice of the confident manager reveals the attitude towards risk in the country. Here, the confident manager chooses the risky project as the remuneration of the risky commodity is higher than the relative expected productivities.

Section 4. International Trade

Consider two countries O and P. The model assumes that the only difference between countries is that in managers' psychological structure. Country O is relatively more optimistic than country P:

$$\forall n \in \left]0,1\right[, \Psi_O(n) > \Psi_P(n) \tag{6}$$

A given entrepreneur *n* ranked in the continuum $\left]0,1\right[$ is always more optimistic in country O than in country P.

4.1. The law of comparative advantage

The law of comparative advantage holds and the difference in autarky prices determines the pattern of trade. Under autarky, the relative price in country is given by (4):

$$p_J^a = \frac{1}{\theta \delta_J^a} \tag{7}$$

INSERT FIGURE 4

Since demand conditions are identical in both countries, comparative advantage depends only on international differences in managers' psychology. This result is illustrated in Figure 4. With identical demand conditions, the upward sloping curve $\phi\phi$ is the same in country O and country P. Thus, in equilibrium, the level of entrepreneurship is higher in country O than in country P. Therefore, from (6) and (7), the relatively more optimistic country has a comparative advantage in the risky commodity:

$$\delta_O^a > \delta_P^a \Leftrightarrow p_O^a < p_P^a . \tag{8}$$

Proposition 1. Country O has a comparative advantage in the production of the risky commodity since the marginal manager is, under autarky, relatively more optimistic in country O than in country P.

4.2. Free Trade Equilibrium

We assume that each manager knows the psychological structure in both countries. Then, each manager is able to compute the equilibrium price and wages resulting from the decision rule.

World aggregate supply of commodity R is $y_R^* = \left(n_O^* + n_P^*\right)\theta$. Moreover, world aggregate demand for commodity R is given by $d_R^* = b \times \frac{\left(y_O^* + y_P^*\right)}{p^*}$ with $y_J{}^* = p^*\theta n_J^* + \left(1 - n_J^*\right)$, j=O,P.

At equilibrium, $y_R^* = d_R^*$. Therefore,

$$p^* = \frac{b}{(1-b)\theta} \times \frac{1 - n_O^* + 1 - n_P^*}{n_O^* + n_P^*}. \tag{9}$$

As in autarky, the marginal manager is indifferent between C and R if the expected wages from each project are identical. Thus, from (3), (4) and (9), it follows that the degree of optimism of the marginal manager δ^* is:

$$\delta^* = \frac{1-b}{b} \times \frac{n_O^* + n_P^*}{1 - n_O^* + 1 - n_P^*} \tag{10}$$

The free-trade equilibrium exists and is unique (for the proof, see Appendix B). In each country, relatively optimistic managers with optimism greater than δ^* choose the risky project. By definition, for any degree of optimism δ^*, the level of entrepreneurship is higher in O than in P. International trade will thus occur according to the law of comparative advantage.

Proposition 2. Under free trade, the relative price of the risky commodity lies between the autarky prices: $p_O^a \le p^* \le p_P^a$. *When demand conditions are identical, the relatively optimistic country will export the risky commodity while the pessimistic country will export the certain commodity. The proof is given in Appendix C.*

Section 5. Ex-ante welfare analysis

The *ex-ante* analysis compares welfare under autarky to that under free trade, *before* the resolution of uncertainty. *Ex-ante* welfare depends on the expected income of managers, given their perception of risk.

5.1. Methodology

Given the demand functions depicted in section 3, the underlying expected utility function of manager *i* before the resolution of uncertainty is:

$$V_{ik} = b^b (1-b)^{1-b} E(\tilde{y}_{ik})\, p^{-b} \;;\; k = R, C \tag{11}$$

where $E(\tilde{y}_{ik})$ is the expected income of manager *i*, which depends on production choice:

$$E(\tilde{y}_{ik}) = \begin{cases} 1 & \text{for } k = C \\ g_i(\theta)\, p & \text{for } k = R \end{cases} \tag{12}$$

The effect of international trade on *ex-ante* welfare depends on the sign and the magnitude of the income effect (IE) and the price effect (PE). Converting from (11) the ratio of welfare under free trade to welfare under autarky into logarithmic form, the effect of free trade on *ex-ante* welfare depends on the sign of:

$$\ln(V_{iJ}^* / V_{iJ}^a) = \ln(E(\tilde{y}_{iJ}^*) / E(\tilde{y}_{iJ}^a)) - b \ln(p^* / p_J^a) = IE_{iJ} + PE_{iJ}. \tag{13}$$

In each country, there are *ex-ante* winners and losers, depending on the production projects chosen under free trade and autarky. We can then examine the possibilities for compensation

within countries and between countries. Since *ex-ante* welfare is related to the psychology of each manager, an aggregation problem arises. We overcome this difficulty using the Hicksian compensation measure of welfare. This latter describes, for each manager, the lump-sum transfer required to produce under free trade the same level of utility as under autarky. Denote by T_i this Hicksian compensation. From (11), T_i is given by:

$$\left[E\left(\tilde{y}_{ik}^{*}\right)+T_i\right]p^{*-b}=E\left(\tilde{y}_{ik}^{a}\right)p^{a-b}. \tag{14}$$

Country J is thus better off when the sum of these compensated incomes is negative:

$$T_J=\int_0^1 T_i di<0. \tag{15}$$

5.2. Ex-ante winners and losers from free trade

In both countries, free trade makes some managers better off and some others worse off (see Table 1). Let us consider the case of country O. In the more optimistic country, all managers are harmed by a negative price effect since the relative price of commodity R is increasing.

Table 1. Ex-ante winners and losers from free trade

	Country O			Country P		
Group	I	II	III	IV	V	VI
Project choice:						
- autarky	R	C	C	R	R	C
- free trade	R	R	C	R	C	C
Population share	n_O^a	$n_O^*-n_O^a$	$1-n_O^*$	n_P^*	$n_P^a-n_P^*$	$1-n_P^a$
Income effect	+	+	=	-	-	=
Price effect	-	-	-	+	+	+
Ex-ante welfare	Better off	?	Worse off	Worse off	?	Better off

Note: C and R denote the certain project and the risky project respectively.

Three groups of managers can be identified according to their project choices under autarky and free trade. Managers who still produce commodity C (group III) must be worse off

because their income remains unchanged. On the contrary, free trade benefits autarky entrepreneurs (group I) because the positive income effect outweighs the negative price effect.

INSERT FIGURE 5

The problem is more complicated for the occupation-switching managers (group II). Among those who change their occupation, there are both winners and losers depending on the strength of the income effect (see Figure 5). The ex-ante income effect, denoted by the dashed area in Figure 5, falls with managers' pessimism. Only part of the relative price change feeds through to income; the other part, denoted by the dotted area, refers to the price increase necessary to make managers switch their occupation.

Similarly, gainers (group VI) and losers (group IV) can be easily identified in country P while occupation-switching managers (group V) can be either winners or losers.

5.3. Compensation schemes

There are no analytic solutions to this problem as the equations are non-linear. Therefore, numerical simulations are required to evaluate the ability of winners to compensate losers (see Appendix E). Simulation 2 shows that policy redistribution sometimes fails in the more pessimistic country for some parameter values whereas it seems to be typically successful in the more optimistic country. This result is closely related to the assumption of heterogeneous managers. When managers are identical within each country, Blanchard and Peltrault (2004) show that free trade always improves *ex-ante* welfare because all managers in country P enjoy a positive price effect whereas the income effect is zero.

Further, the more optimistic country can offset the fall in *ex-ante* welfare in the more pessimistic country: at least in all the specifications tested, there is a feasible compensation scheme between countries. The impact of free trade on *ex-ante* welfare is summarized in the following proposition.

Proposition 3. In both countries, there are winners and losers from the opening of trade. A feasible compensation scheme guaranteeing a Pareto welfare improvement within countries does not always exist, at least for the more pessimistic country. Ex-ante trade losses are due to manager heterogeneity in risk attitudes.

Section 6. Ex-post welfare analysis and policy implications.

The *ex-post* analysis compares autarky welfare to free trade welfare after the resolution of uncertainty. Whereas the *ex-ante* approach is more convenient at the individual level, *ex-post* analysis is best suited to the social level. This point of view is summarized by Blackorby, Donaldson and Mongin (2004, page 2): "as regard to rationality considerations, the ex-post approach makes a point of treating the managers and social entity alike, a crucial difference with the ex-ante approach".

6.1. The effect of free trade on ex-post welfare

In autarky, the collective *ex-post* utility of country J is given by:

$$U_J^a = (1-b)^{1-b} \times b^b \times y_J^a \times (p^a)^{-b}.$$

From (5) and (7), we have:

$$U_J^a = (1-b)^{1-b} \times b^b \times \theta^b \times \frac{(\delta_J^a)^b}{1-b+b\delta_J^a}.$$

Aggregate utility in country J depends on both the psychological structure of the population and demand conditions. The first-best optimum is reached when the marginal manager is confident *i.e.* when $\delta_J^a = 1$. In that case, the number of entrepreneurs is $n^a = b$. The entrepreneurship deficit or surplus can then be defined as follows.

Definition 2. In autarky, the gap between the actual and the optimal number of entrepreneurs is $D = n^a - b$. *The economy faces an entrepreneurial deficit if D < 0 and an entrepreneurial surplus if D > 0.*

Simulation results

First, at least one country benefits from the opening of trade (see Appendix D). Country O (P) is always better off if the world economy is globally pessimistic (optimistic). Hence, a confident country under autarky always benefits from trade. Numerical simulations (see Appendix E) are required for the further conclusions reported in Table 2.

Table 2. The impact of free trade on ex-post welfare.

	Country O	Country P	World
Optimistic world	Better off / worse off	Better off	Better off / worse off
Pessimistic world	Better off	Better off / worse off	Better off/ worse off

Simulation 3 shows that either country O or country P might end up worse off. Hicksian compensation is used to evaluate the ability of one country to offset the fall in welfare in the other. The world can be worse off whether the world is globally pessimistic (simulation 4) or optimistic (simulation 5). Hence, free trade can amplify the distortion of resource allocation associated with autarky. This is the case in simulation 5 where both countries suffer from entrepreneurship surplus in autarky (δ_O^a and δ_P^a are greater than 1). Here, the worldwide entrepreneurship surplus is amplified by free trade since $n_O^* + n_P^* > n_O^a + n_P^a$. The reverse case is illustrated by simulation 4, where free trade increases the worldwide entrepreneurship deficit.

Proposition 4. The impact of free trade on ex-post welfare can be either positive or negative. When the world is globally pessimistic (optimistic) the welfare of the more optimistic (pessimistic) country increases but the welfare of the other country may fall. Moreover, the

gains from trade in one country do not necessarily outweigh the losses of the other. The world economy can end up worse off with trade.

Economic interpretations

When the world is globally optimistic, proposition 4 states that the *ex-post* welfare of country O may fall with free trade. The reason is that the relative price of commodity R is not high enough to reward the risk that entrepreneurs objectively face. In fact, p^* is lower than the equilibrium price without any distortions[5]. Therefore, entrepreneurs receive a negative Objective Risk Premium: $ORP = p^*\theta - 1 < 0$. With the opening of trade, these negative risk premia flow into country O, where the level of entrepreneurship increases[6].

INSERT FIGURE 6

The effect of free trade on *ex-post* welfare mainly depends on demand conditions and the psychological distance between countries. On the one hand, each country profits from greater demand for the commodity in which the country specializes. As illustrated in Figure 6, country O is better off when the demand for the commodity R is high enough (b>0.47). Conversely, country P is better off when the demand for commodity R is low (b<0.53). On the other hand, the impact of free trade on welfare also depends on the psychological distance between countries, defined by the two distributions of distorted probabilities.

INSERT FIGURE 7

Figure 7 provides an example of the effect of psychological distance on the gains from trade. A higher value of Zp means that country P becomes less optimistic and that the psychological distance with country O increases. When the psychological distance is low (Zp<2), the world

[5] When managers are confident, the equilibrium price of commodity R is equal to the ratio of expected productivities, that is $p = 1/\theta$.

[6] When the world is globally pessimistic, risk premia are positive and flow out of the more pessimistic country.

degree of optimism is high which means the ORP remains negative. Country O is then worse off since free trade implies more entrepreneurs and more negative ORP. As the psychological distance increases, world optimism decreases and the *ex-post* welfare of country O increases. In the end, country O benefits from trade if the distance is high enough (Zp>2). A large psychological distance will make both countries better off as long as it helps to counterbalance each country's distortion.

6.2. Trade Policy Implications

The whole problem of uncertainty is that decisions are made which may be later regretted. As illustrated in Figure 7, *ex-ante* and *ex-post* analysis lead to opposite policy recommendations for some values of the psychological distance Zp. At least for the specifications tested, country O is always willing to trade before the resolution of uncertainty. However, after the resolution of uncertainty country O is likely to regret this decision when the world is globally optimistic and the relative price of commodity R is not high enough to reward the risk. Once again, this is a matter of risk premia. Before the resolution of uncertainty, entrepreneurs in country O expect that the risky project will provide a positive Subjective Risk Premium with $SRP_i = g_i(\theta)p - 1$. But after the resolution of uncertainty entrepreneurs come down to earth and receive the negative objective risk premium.

INSERT FIGURE 7

Conversely, country P may be reluctant to trade with country O before the resolution of uncertainty. In Figure 7, the *ex-ante* welfare of country P falls with free trade when the psychological distance is smaller than 1.7. In this case, autarky is better than free trade before the resolution of uncertainty. Yet, country P should have chosen to trade since *ex-post* welfare is larger with the opening of trade. The reason is that some entrepreneurs under autarky don't

want to give up their positive SRP with the opening of trade. They should, however, since the ORP is actually negative.

Section 7. Conclusion

This paper has considered the role of international differences in managers' psychology in influencing trade and the welfare effects of free trade. Countries will export the commodity in which they have a comparative advantage: the more optimistic country exports the risky commodity whereas the more pessimistic country exports the certain commodity. When trade is driven by a psychological bias, it is shown that free trade is not always welfare improving and that *ex-ante* and *ex-post* analysis can lead to opposing policy recommendations.

As reported by the Global Entrepreneurship Monitor (2002), 10.5% of the adult population is involved in the creation and growth of start-up businesses in the United States. The rate of entrepreneurial activity is lower in the main trade partners of the United States: 1.8% in Japan, 3.2% in France, 5.2% in Germany and 5.4% in the United Kingdom. According to the European Commission, Europe suffers from an entrepreneurship deficit in comparison with the US, which could damage long-term growth prospects in Europe. But the effect of free trade is unclear since *ex-ante* and *ex-post* welfare can lead to opposite conclusions. More pessimistic countries like Europeans could be worse off from the *ex-ante* perspective but better off from the *ex-post* perspective.

References

Bénabou, R., Tirole, J., 2002. Self-Confidence and Personal Motivation, Quarterly Journal of Economics 117, 871-915.

Bernard, A., Eaton, J., Jensen, B., Kortum, S., 2003. Plants and Productivity in International Trade, American Economic Review 93, 1268-90.

Bernard, A., Redding, S., Schott P., 2004. Comparative Advantage and Heterogeneous Firms, NBER Working Paper N° 10668.

Blackorby, C., Donalson, D., Mongin, P., 2004. Social Aggregation without the Expected Utility Hypothesis, laboratoire d'économétrie de l'Ecole Polytechnique, Cahier 2004-020.

Blanchard, M., Peltrault, F., 2004. The welfare effects of international trade with optimistic and pessimistic managers, Economics Bulletin 6 (15), 1-10.

Brainard, W.C., Cooper, R.N., 1968. Uncertainty and Diversification of International Trade, Food Research Institute in Agricultural Economics, Trade and Development 8, 257-285.

Carillo, J., Mariotti, T., 2000. Strategic Ignorance as a Self-Disciplining Device, Review of Economic Studies 67, 529-544.

Cooper, A.C., Woo, C.Y., Dunkelberg, W.C., 1988. Entrepreneurs' Perceived Chances for Success, Journal of Business Venturing 3, 97-108.

Diamond, D.W., Dybvig P.H., 1983. Bank Runs, Deposit Insurance and Liquidity, Journal of Political Economy 91, 401-419.

Doherty, N, Eeckhoudt L., 1995. Optimal insurance without expected utility: The Dual Theory and the linearity of insurance contracts, Journal of Risk and Uncertainty 10, 157-179.

Falvey, R., Greenaway, D., Yu, Z., 2004. Intra-Industry Trade between Asymmetric Countries with Heterogeneous Firms, The University of Nottingham, Research Paper Series.

Global Entrepreneurship Monitor 2002. GEM Executive Report, Downloadable at http://www.gemconsortium.org

Judd, K.J., 1985. The Law of Large Numbers with a Continuum of IID Random Variables, Journal of Economic Theory 35, 19-25.

Hammond P.J, 1981. *Ex-ante* and *Ex-post* Welfare Optimality under Uncertainty, Economica 48, 235-250.

Hofstede, G., 2001. Culture's Consequences, 2nd edition, Sage publications.

Jean, S., 2002. International Trade and Firms' Heterogeneity under Monopolistic Competition, Open Economies Review 13, 291-311.

Kahneman, D., Tversky, A., 1979. Prospect Theory: An Analysis of Decision under Risk, Econometrica 47, 263-291.

Kihlstrom, R., Laffont, J.J., 1979. A General Equilibrium Entrepreneurial Theory of Firm Formation based on Risk Aversion, Journal of Political Economy 87, 719–748.

Lucas, R.E., Prescott, E., 1974. Equilibrium Search and Unemployment, Journal of Economic Theory 7, 188-209.

Melitz, M., 2003. The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity, Econometrica 71, 1695-1726.

Moskovitz, T., Vissing-Jorgensen, A., 2002. The Private Equity Puzzle, American Economic Review 92, 745-778.

Newbery, D., Stiglitz, J., 1984. Pareto Inferior Trade, Review of Economic Studies 51, 1-12.

Ross, L., Anderson, C., 1982. Shortcomings in the attribution process: On the origins and maintenance of erroneous social assessments, In Judgment under Uncertainty: Heuristics and Biases (eds. Kahneman, D., Slovic, P., and Tversky A.,). Cambridge: Cambridge University Press.

Shy, O., 1988. A General Equilibrium Model of Pareto Inferior Trade, Journal of International Economics 25, 143-154.

Starmer, C., 2000. Developments in Non-Expected Utility Theory: The Hunt for a Descriptive Theory of Choice under Risk, Journal of Economic Literature 38, 332-382.

Van der Steen, E., 2004. Rational Overoptimism (and Other Biases), American Economic Review 94, 1141-1151.

Yaari, M., 1987. The Dual Theory of Choice under Risk, Econometrica 55, 95-115.

Appendices

A. Existence and Uniqueness of the Autarky Equilibrium

Under autarky, the degree of optimism of the marginal entrepreneur is:

$$\delta^a = \frac{1-b}{b} \times \frac{n^a}{1-n^a} \Leftrightarrow h(\delta^a) \times \delta^a = \frac{1-b}{b},$$

$$\text{with } h(\delta) = \frac{1}{\Psi^{-1}(\delta)} - 1. \tag{16}$$

The function $h(\delta)$ is strictly increasing on $\left]\underline{\delta}, \bar{\delta}\right[$ as $\Psi^{-1}(\delta)$ is a strictly decreasing function on $\left]\underline{\delta}, \bar{\delta}\right[$. Moreover, $\lim_{\delta \to \underline{\delta}} h(\delta) = 0$ and $\lim_{\delta \to \bar{\delta}} h(\delta) = +\infty$.

Hence $\lim_{\delta \to \underline{\delta}} h(\delta) \times \delta = 0$ and $\lim_{\delta \to \bar{\delta}} h(\delta) \times \delta = +\infty$ and there exists an unique $\delta^a \in \left]\underline{\delta}, \bar{\delta}\right[$ such that $h(\delta^a) \times \delta^a = \frac{1-b}{b}$. The autarky equilibrium always exists and it is unique. ■

B. Existence and Uniqueness of the Free Trade Equilibrium

Under free trade, the degree of optimism of the marginal entrepreneur δ^* is:

$$\delta^* = \frac{1-b}{b} \times \frac{n_O(\delta^*) + n_P(\delta^*)}{1-n_O(\delta^*) + 1 - n_P(\delta^*)} \Leftrightarrow f(\delta^*) \times \delta^* = \frac{1-b}{b},$$

$$\text{with } f(\delta) = \frac{2}{\Psi_O{}^{-1}(\delta^*) + \Psi_P{}^{-1}(\delta^*)} - 1. \tag{17}$$

The function $f(\delta)$ is strictly increasing on $\left]\underline{\delta}_P, \bar{\delta}_O\right[$ since $\Psi_J{}^{-1}(\delta)$ is a strictly decreasing function in δ. Also, $\lim_{\delta \to \underline{\delta}_p} f(\delta) = 0$ and $\lim_{\delta \to \bar{\delta}_O} f(\delta) = +\infty$.

Hence $\lim_{\delta \to \underline{\delta}_P} f(\delta) \times \delta = 0$ and $\lim_{\delta \to \bar{\delta}_O} f(\delta) \times \delta = +\infty$ and there exists a unique $\delta^* \in \left]\underline{\delta}_P, \bar{\delta}_O\right[$

such that $f(\delta) \times \delta = \frac{1-b}{b}$. The free trade equilibrium exists and it is unique. ■

C. Specialization under Free Trade

We demonstrate that the relative price under free trade is between the two autarky prices:

$p_O^a < p^* < p_P^a \Leftrightarrow \delta_P^a < \delta^* < \delta_O^a$.

As country O is globally more optimistic than country P, we have

$\forall n \in \left]0,1\right[, \Psi_O(n) > \Psi_P(n)$

Therefore, from (16) and (17), it follows that $h_P(\delta) > f(\delta) > h_O(\delta)$.

For $\delta = \delta^*$, we have $h_P(\delta^*) \times \delta^* > f(\delta^*) \times \delta^* > h_O(\delta^*) \times \delta^*$

and $h_P(\delta^*) \times \delta^* > \frac{1-b}{b} > h_O(\delta^*) \times \delta^*$

So $h_P(\delta^*) \times \delta^* > h_P(\delta_P^a) \times \delta_P^a$ and $h_O(\delta_O^a) \times \delta_O^a > h_O(\delta^*) \times \delta^*$.

Since $h_j(\delta) \times \delta$ is a strictly increasing function in δ, then we have $\delta_P^a < \delta^* < \delta_O^a$. Thus, country O and country P produce respectively more of the risky commodity and the certain commodity than under autarky. ■

D. One Country is always better off with trade after the resolution of uncertainty.

Under autarky, the equilibrium level of consumption is $d_{Rj}^a = \theta n_j^a$ and $d_{Cj}^a = (1 - n_j^a)$.

Let $y_j^{'}$ denote the national income required to maintain this level of consumption under free trade. Since $p^* = \frac{1}{\theta\delta^*}$, we have $y_j^{'} = \frac{1}{\delta^*} \times n_j^a + (1 - n_j^a)$.

When trade opens, the income of country J is $y_j^* = \frac{1}{\delta^*} \times n_j^* + (1 - n_j^*)$.

Clearly, country J is better off *ex-post* under free trade if y_j^* is higher than $y_j^{'}$:

$$y_j^* > y_j^{'} \Leftrightarrow \left(\frac{1}{\delta^*} - 1\right) \times \left(n_j^* - n_j^a\right) > 0.$$

Whatever the degree of world optimism, country O produces more of commodity R under free trade than under autarky ($n_O^* > n_O^a$). The reverse holds for country P ($n_P^* < n_P^a$).

Thus, $y_O^* > y_O^{'} \Leftrightarrow \delta^* < 1$ and $y_P^* > y_P^{'} \Leftrightarrow \delta^* > 1$. Therefore, one country is always better off with trade after the resolution of uncertainty. When the world economy is globally pessimistic (optimistic), country O (country P) is always better off. ■

Note that a globally confident country under autarky ($\delta_j^a = 1$) always benefits from the opening of trade. When the other country is optimistic (pessimistic), the confident country is indexed by P (O) and the world economy is globally optimistic (pessimistic).

E. Simulation results

***Ex-ante* analysis**

<u>*Simulation 1*</u>: country O and P are better off

The psychological structure of managers is $\Psi_O(n) = \theta^{0.3-1+n}$ and $\Psi_P(n) = \theta^{0.3-1+2n}$.

With b = 0.51 and θ = 0.45, we have $\delta_O^a = 1.13$, $\delta_P^a = 0.832$ and $\delta^* = 1.0117$. The sum of the compensated incomes are $T_O = \int_0^1 T_{iO} di = -0.0223$ and $T_P = \int_0^1 T_{iP} di = -0.0052$. Therefore country O and country P are *ex-ante* better off with trade. Moreover, the world is better off since $\sum_j T_W = -0.0275$.

Simulation 2: country P is worse off

The psychological structure of managers is $\Psi_O(n) = \theta^{0.3-1+n}$ and $\Psi_P(n) = \theta^{0.3-1+1.4n}$.

With b = 0.51 and θ = 0.45, we have $\delta_O^a = 1.13$, $\delta_P^a = 0.99$ and $\delta^* = 1.069$. The compensated incomes are $T_O = -0.0086$ and $T_P = 0.0028$. Therefore, country O is better off with trade whereas country P is worse off. Moreover, the world is better off since $\sum_j T_W = -0.0058$.

***Ex-post* analysis**

Simulation 3: country O or country P might be worse off.

The psychological structure of the managers in countries O and P are respectively:

$\Psi_O(n) = \theta^{0.3-1+n}$ and $\Psi_P(n) = \theta^{0.7-1+n}$

For all simulated values of the parameters b and θ the world is always better off ($T_W < 0$).

When the world is globally optimistic ($\delta^* > 1$), country P is always better off with trade. Country O can be either worse off or better off with trade depending on the parameter values.

– with b = 0.35 and θ = 0.45, we have $\delta_O^a = 1.26$, $\delta_P^a = 0.96$, $\delta^* = 1.022$. The impact of free trade on *ex-post* welfare is $\Delta U_O = -0.0055$ and $\Delta U_P = 0.0072$.

– with b = 0.43 and θ = 0.001, we obtain $\delta_O^a = 2.12$, $\delta_P^a = 0.68$ and $\delta^* = 1.2$. The impact of free trade on *ex-post* welfare is $\Delta U_O = 0.0002$ and $\Delta U_P = 0.0005$.

When the world is globally pessimistic ($\delta^* < 1$), country O is always better off while country P can be either worse off or better off according to the parameter values:

– with b = 0.66 and θ = 0.45, we have $\delta_O^a = 1.02$, $\delta_P^a = 0.78$ and $\delta^* = 0.89$. The impact of free trade on *ex-post* welfare is $\Delta U_O = 0.0065$ and $\Delta U_P = -0.0052$.

– with b = 0.51 and θ = 0.45, we obtain $\delta_O^a = 1.13$, $\delta_P^a = 0.87$ and $\delta^* = 0.99$. The impact of free trade on *ex-post* welfare is $\Delta U_O = 0.00115$ and $\Delta U_P = 0.00035$.

Simulation 4: A globally pessimistic world might be worse off.

The psychological structure of the managers in countries O and P are respectively:

$\Psi_O(n) = \theta^{0.5-1+n}$ and $\Psi_P(n) = \theta^{0.5-1+n^{0.1}}$

For some values of parameters, the world is globally pessimistic and is worse off with trade. With b = 0.66 and θ = 0.45 we obtain $\delta_O^a = 0.89$, $\delta_P^a = 0.67$ and $\delta^* = 0.73$. The impact of free trade on *ex-post* welfare is $\Delta U_O = 0.0239$, $\Delta U_P = -0.0257$ and $T_W = 0.0071$. Note that the aggregate number of entrepreneurs falls: $n_O^a + n_P^a = 1.22 > n_O^* + n_P^* = 1.18$.

Simulation 5: A globally optimistic world might be worse off.

The psychological structure of the managers in countries O and P are respectively:

$\Psi_O(n) = \theta^{0.3-1+n}$ and $\Psi_P(n) = \theta^{0.3-1+3n}$

For some values of parameters, the world is globally optimistic and is worse off with trade. With b = 0.2 and θ = 0.45 we obtain $\delta_O^a = 1.42$, $\delta_P^a = 1.06$ and $\delta^* = 1.3$. The impact of free

trade on *ex-post* welfare is $\Delta U_O = -0.0132$, $\Delta U_P = 0.0127$ and $T_W = 0.001$. The aggregate number of entrepreneurs rises: $n_O^a + n_P^a = 0.4711 < n_O^* + n_P^* = 0.4915$.

Figure 1. From actual risk to choice

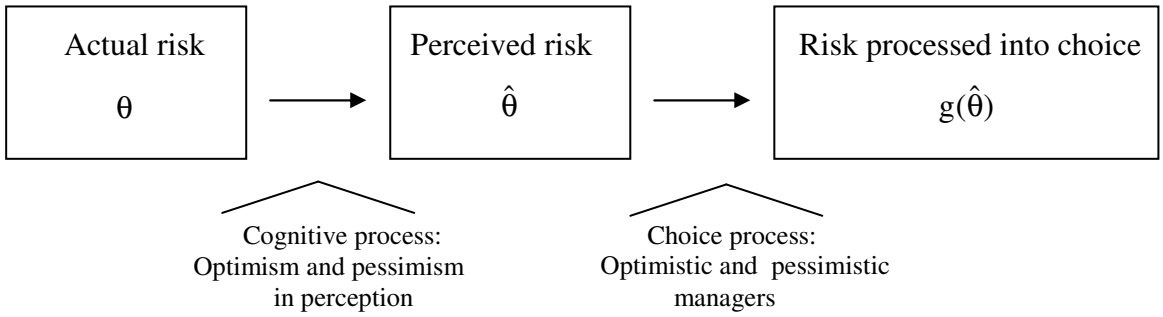


Figure 2a.

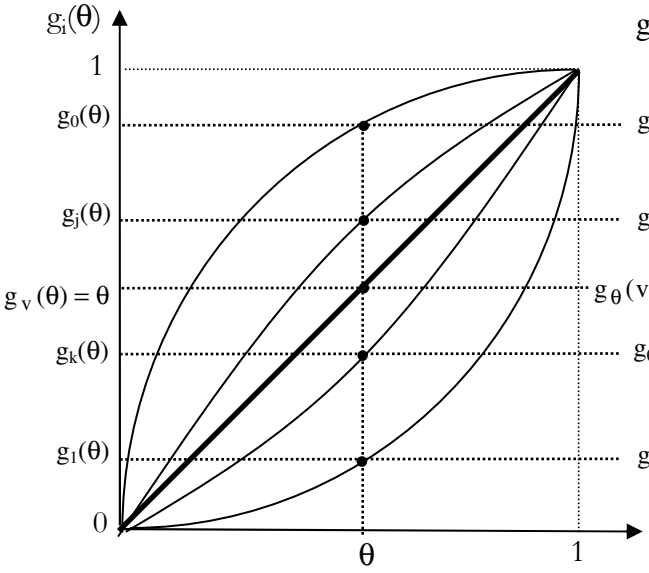


Figure 2b.

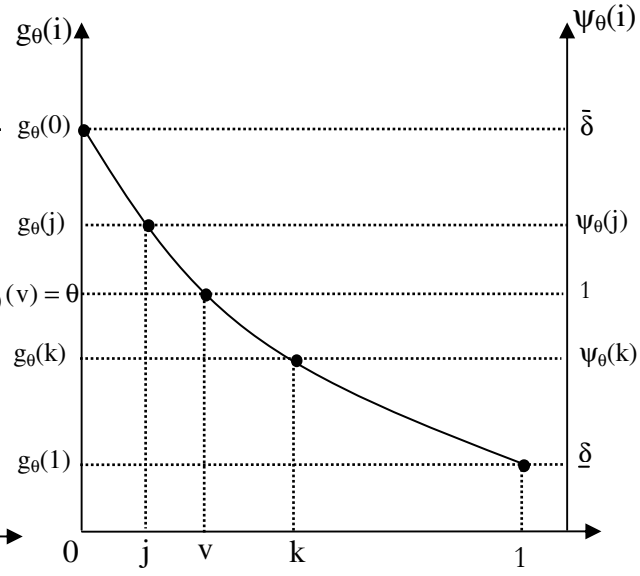


Figure 3. Autarky equilibrium

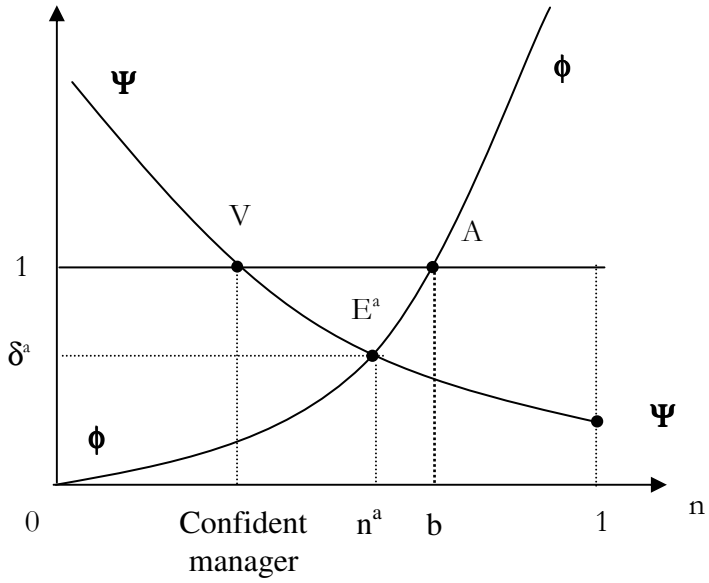


Figure 4. Comparative advantages

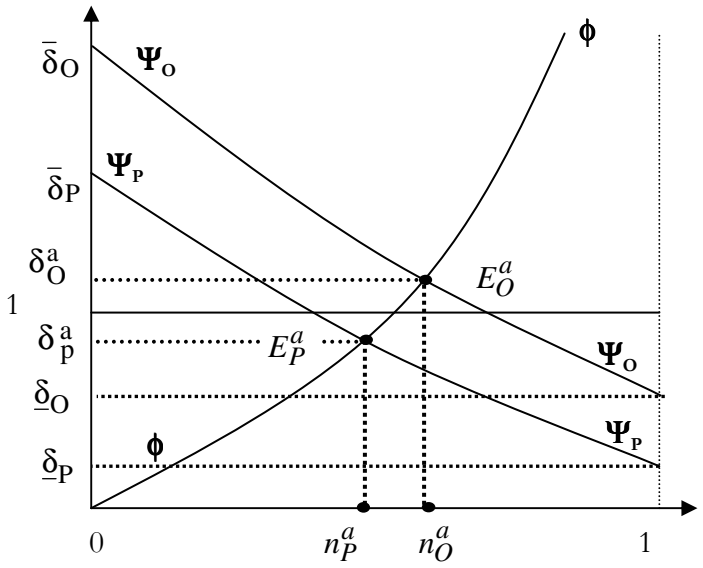


Figure 5. The ex-ante income effect in the optimistic country

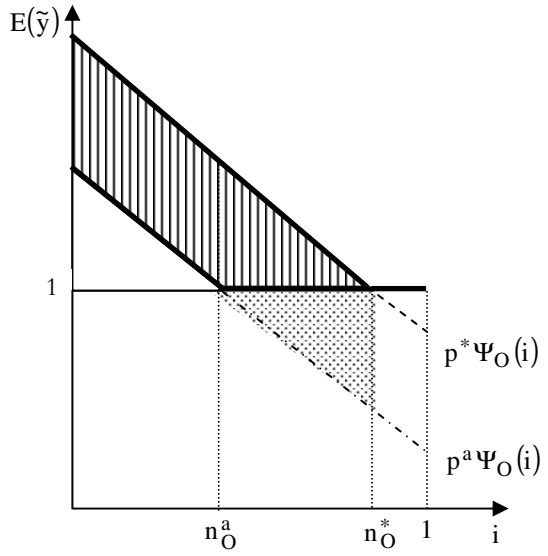
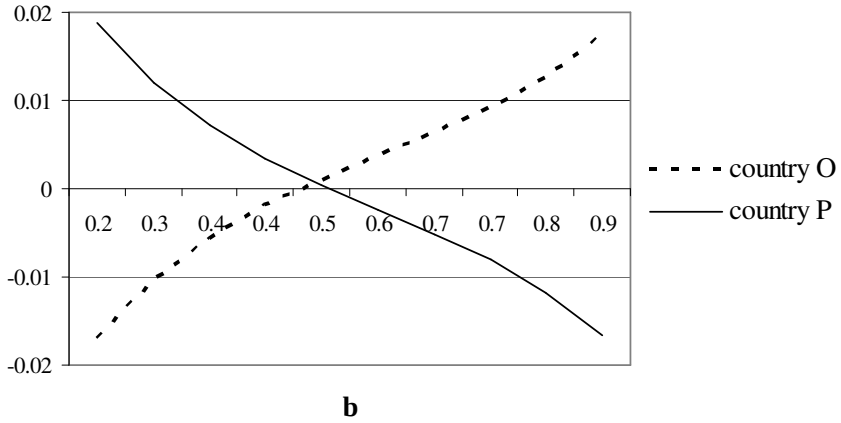


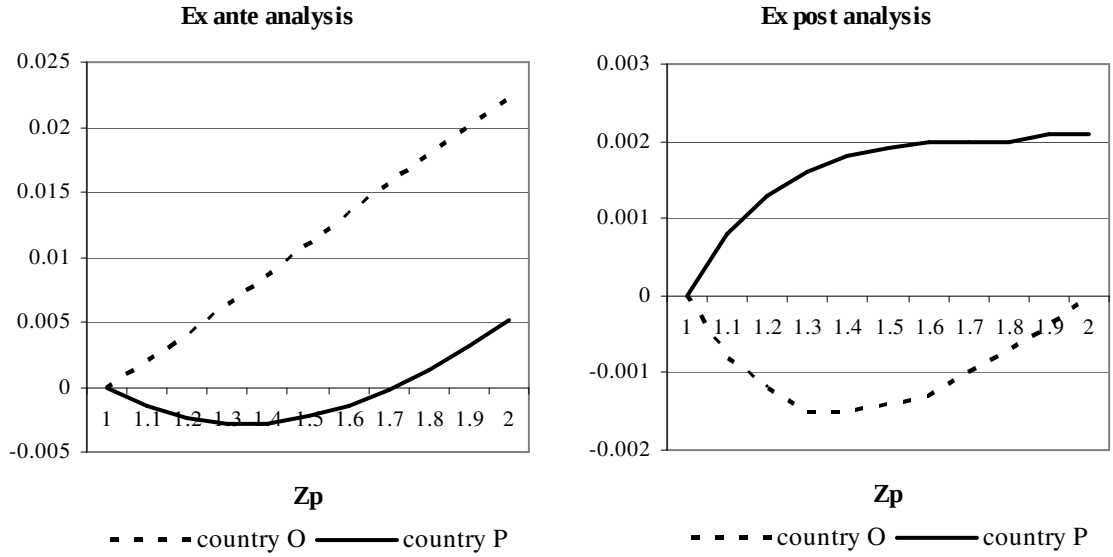
Figure 6. Demand conditions and ex-post gains from trade



b

Note: the distribution functions of distorted probabilities are $\Psi_O(n) = \theta^{0.7-1+n}$ and $\Psi_P(n) = \theta^{0.3-1+n}$, with $\theta = 0.45$.

Figure 7. The psychological distance between countries and the gains from trade



Note: The *ex-ante* and *ex-post* gains from trade are given for both countries along the y-axis. *Zp* is an indicator of the psychological distance along the x-axis. The distribution functions are $\Psi_O(n) = \theta^{0.3-1+n}$ and $\Psi_P(n) = \theta^{0.3-1+Zp\times n}$ with $\theta = 0.45$, and demand conditions are given by $b = 0.51$. When *Zp* is greater than 1, country O and country P export the commodity in which they enjoy comparative advantage.