The welfare effects of international trade with optimistic and pessimistic managers

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Abstract

This paper investigates the welfare effects of international trade when technological idiosyncratic risk is distorted by optimistic and pessimistic managers. We show that free trade always improves the ex–ante welfare but sometimes lowers the ex–post welfare. Free trade commitment can be regretted ex–post.

1. Introduction

As already shown by Newbery and Stiglitz (1984) and Shy (1988), technological uncertainty can damage the normative theorem of international trade. More precisely, they show that free trade can lower the *ex-ante* welfare when global risk is negatively correlated between countries. Under the assumption of global risk, the *ex-post* welfare analysis poses problem because *ex-post* welfare is different in each state of nature.

We depart from these frameworks by introducing idiosyncratic risk without an insurance market. Since the law of large numbers applies, it is possible to eliminate the macroeconomic uncertainty on *ex-post* welfare. Hence, it now makes sense to analyse the effect of international trade on *ex-post* welfare. Moreover, we assume that managers misperceive probabilities following Kahneman and Tversky (1979). Consequently both pessimistic and optimistic managers are allowed in this paper whereas Newbery and Stiglitz (1984) and Shy (1988) consider only risk averse managers.

The dual theory of choice under risk introduced by Yaari (1987) is useful to deal with how the perceived risk of managers is processed into production choice. Then, the interaction of production uncertainty and psychology gives the basis for trade as long as one country is relatively more optimistic than the other. From the normative point of view, free trade always improves *ex-ante* welfare but sometimes lowers *ex-post* welfare. Moreover lump-sum transfers are not always possible since the word as a whole can be worse off with the opening of trade.

2. The model

There are two countries indexed by O and P. Each country has a continuum of managers indexed on the interval $[0,1]$ who have to choose exclusively[1] between two production project C and R. Project C is certain and provides one unit of commodity C. Project R is risky since it provides one unit of commodity R with probability θ and 0 with probability $1-\theta$. Managers who choose the risky project will be called entrepreneurs.

Risk is idiosyncratic to each manager's project rather than global[2]. Even though the probability of success θ is well-known, managers tend to distort the objective probability. This psychological bias leads them to overestimate or underestimate the chance that their project will be successful. In fact entrepreneurs may choose risky activities because they exhibit more optimism than others. This saying is supported by empirical findings. Among others, Cooper, Dunkelberg and Woo (1988) test this assumption and find that 68% of entrepreneurs perceive their prospects for success better than those for similar business. Moreover it seems that entrepreneurs do not learn from experiences. In fact, as quoted by Ross and Anderson (1982), such beliefs tend to persist because people care about their self esteem. Like other people, entrepreneur could be reluctant to memorize ego-threatening information. At best, Bayesian revision is incomplete as in Benabou and Tirole (2002).

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[1] Moskovitz and Vissing-Jorgensen (2002) point out that entrepreneurial investment is very concentrated. This lack of diversification is very puzzling because the return of entrepreneurship tends to be low when controlling for risk.

[2] As quoted 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 economic literature which explicitly or implicitly avoids this difficulty. See for instance Diamond and Dybvig (1983) or Lucas and Prescott (1974).

In each country, managers have the same perception of risk. Following Yaari (1987), the objective probability is distorted by managers and their subjective probability of success is given by $g(i) = \overline{g}_J$, $\forall i \in [0,1]$ and $J = O, P$. Let Γ denote the Yaari preference function which is linear in income. Given w_R and w_C, respectively the income provided by the risky and the certain project, then we have $\Gamma(R) = g(i) \times w_R$ and $\Gamma(C) = w_C$.

Decision rule: manager i chooses the risky project if:

$$\Gamma(R) > \Gamma(C) \Leftrightarrow g(i) \times w_R > w_C.$$

The two countries are identical except that managers have different perceptions of risk. Let $\overline{\delta}_J = \overline{g}_J / \theta$ denote the degree of optimism. Country J is optimistic if $\overline{\delta}_J > 1$ and pessimistic if $\overline{\delta}_J < 1$. It is assumed that $\overline{\delta}_O > \overline{\delta}_P$: managers in country O are relatively more optimistic than in country P. Commodity C is the *numéraire* so *p* refers to the relative price of commodity R in terms of commodity C. 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 : $d_{CJ} = (1-b)y_J$ and $d_{RJ} = by_J / p$ where y_J is the aggregate income of country J.

Welfare analysis is based on two criteria. Before the resolution of uncertainty, the aggregate welfare depends on $E(\tilde{y}_J)$ i.e. the expected income of managers given their perception of risk. Since the Yaari preference function is linear in income, the *ex-ante* welfare of country J is $V_J = KE(\tilde{y}_J)p_J^{-b}$, where K is a positive constant $K = b^b(1-b)^{1-b} > 0$. After the resolution of uncertainty, the aggregate welfare depends on y_J i.e. the effective income of country J. Then, the *ex-post* welfare of country J is $U_J = Ky_J p_J^{-b}$. This distinction is useful to explain why a country can regret *ex-post* a free trade commitment based on the *ex-ante* welfare analysis.

3. Autarky equilibrium

Since decision is made before the resolution of uncertainty, managers have to anticipate the level of earnings provided by each production project. This is possible as long as the perception of risk (i.e. $\overline{g}_J$) and the objective probability θ are common knowledge. Then, the following equations identify the autarky equilibrium in country J.

$$\begin{cases} \dfrac{w_{CJ}}{w_{RJ}} = \dfrac{1}{p_J^a} & (1) \\[3mm] \dfrac{w_{CJ}}{w_{RJ}} = \overline{g}_J & (2) \\[3mm] p_J^a = \dfrac{b}{(1-b) \times \theta} \times \dfrac{1-n_J^a}{n_J^a} & (3) \end{cases}$$

Equation (1) gives the relative wage after resolution of uncertainty since $w_{CJ} = 1$ and $w_{RJ} = p_J^a$. Equation (2) states that managers are indifferent between C and R if the expected wages delivered by each project are equal. The relative price of commodity R which equals demand and supply of commodity R is given by equation (3) where n_J^a refers to the proportion of managers choosing commodity R. These managers become entrepreneurs.

The relative price of commodity R can be found by substituting w_{CJ}/w_{RJ} from (2) into (1). Thus, $p_J^a = (\overline{g}_J)^{-1} = (\theta \overline{\delta}_J)^{-1}$. Then, the proportion of entrepreneurs is given by (3): $n_J^a = \dfrac{b\overline{\delta}_J}{1 - b + b\overline{\delta}_J}$. The effective income in autarky is $y_J^a = (1 - n_J^a) + p_J^a \theta n_J^a = \dfrac{1}{1 - b + b\overline{\delta}_J}$. It follows that *ex-ante* welfare is $V_J^a = K\overline{g}_J^{\ b}$ since $E(\widetilde{y}_J^a) = \overline{g}_J p_J^a = 1$ and *ex-post* welfare is $U_J^a = \dfrac{K(\theta \overline{\delta}_J)^b}{1 - b + b\overline{\delta}_J}$. One can check that *ex-post* welfare is optimal if managers are realist i.e. $\overline{\delta}_J = 1$.

The psychological bias induces a distortion in autarky: a country suffers from an entrepreneurship deficit if managers are pessimistic but from an entrepreneurship surplus as well if managers are optimistic. This result is very similar to Kihlstrom and Laffont (1979) who emphasizes the welfare impact of an entrepreneurship deficit with risk averse managers. More interestingly, we show that optimism is by no mean a better behaviour since an entrepreneurship surplus is suboptimal as well.

3. Free trade

3.1. *Comparative advantage and the psychological bias*

International differences in managers' perception of risk give a basis for international trade. Since country O is relatively more optimistic than country P, the comparison of autarky prices gives $p_O^a < p_P^a \Leftrightarrow \overline{\delta}_O > \overline{\delta}_P$: country O and country P will specialize in commodity R and C respectively. The market clearing relative price of commodity R in free trade is such that $y_{RO}^* + y_{RP}^* = d_{RO}^* + d_{RP}^*$. When both countries are completely specialized, we obtain $p^* = \dfrac{b}{(1 - b) \times \theta}$ since $y_{RO}^* = \theta \quad y_{RP}^* = 0 \quad y_O^* = \theta p^* \quad y_P^* = 1$.

But demand conditions make countries completely or incompletely specialized.

- Specialization of country O is incomplete when $p^* = p_O^a \Leftrightarrow b \leq \dfrac{1}{1 + \overline{\delta}_O}$.

- Specializations are complete when $p_O^a < p^* < p_P^a \Leftrightarrow \dfrac{1}{1 + \overline{\delta}_O} < b < \dfrac{1}{1 + \overline{\delta}_P}$.

- Specialization of country P is incomplete when $p^* = p_P^a \Leftrightarrow b \geq \dfrac{1}{1 + \overline{\delta}_P}$.

3.2. *The effect of free trade on welfare*

If we convert the ratio of welfare in free trade to welfare in autarky to logarithmic form, the effect of free trade on welfare depends on the sign of:

$$\ln(V_J^*/V_J^a) = \ln(E(\tilde{y}_J^*)/E(\tilde{y}_J^a)) - b\ln(p^*/p_J^a) = IE_J + PE_J. \qquad (\textit{Ex-ante} \text{ analysis})$$

$$\ln(U_J^*/U_J^a) = \ln(y_J^*/y_J^a) - b\ln(p^*/p_J^a) = IE_J + PE_J. \qquad (\textit{Ex-post} \text{ analysis})$$

Where PE_J refers to the Price Effect induced by the opening of trade. The magnitude of PE_J is the same whatever the welfare is measured before or after the resolution of uncertainty (see Appendix A). The price effect is negative for country O ($p^* \geq p_O^a$) and positive for country P ($p^* \leq p_P^a$).

On the contrary, the ex-ante and ex-post evaluations of the income effect are not equal. The *ex-ante* income effect, which depends on the expected income, is given by:

$$IE_O = \ln(E(\tilde{y}_O^*)/E(\tilde{y}_O^a)) = \ln(p^*/p_O^a) \quad \text{and} \quad IE_P = \ln(E(\tilde{y}_P^*)/E(\tilde{y}_P^a)) = 0,$$

since $E(\tilde{y}_J^a) = \bar{g}_J p_J^a = 1$, $E(\tilde{y}_O^*) = \bar{g}_O p_O^*$ and $E(\tilde{y}_P^*) = 1$.
The *ex-post* evaluations of IE_J are synthesized in Appendix A.

The effect of free trade on ex-ante welfare

Differences in autarky prices are driven by the perception of risk in each country. Before the resolution of uncertainty, trade is expected to improve welfare because the differences in the perception of risk act as if productivities were not identical between countries. Hence, *ex-ante* welfare increases thanks to traditional gains from specialization and managers would clearly lobby in favour of a free trade commitment.

Proposition 1 *The opening of trade improves the ex-ante welfare of both countries.*

Proof Immediate for country P since *ex-ante* income is not affected by trade and price effect is positive. The *ex-ante* welfare of country O improves as well since the income effect outweighs the price effect: $\ln V_J^* - \ln V_J^a = (1-b)\ln(p^*/p_J^a) \geq 0$. ∎

The effect of free trade on ex-post welfare

Free trade can reduce the *ex-post* distortion induced by the managers' perception of risk. When both countries are pessimistic (optimistic), free trade tends to increase (reduce) the entrepreneurship deficit (surplus) in the relatively less pessimistic (optimistic) country O (country P). In these cases, consumer's *ex-post* welfare raises whatever demand conditions are.

Proposition 2 *The opening of trade improves the ex-post welfare of country O (resp. country P) if managers are pessimistic (resp. optimistic).*

Proof See Appendix B.

Proposition 3 *The opening of trade does not always increase ex-post welfare. One country can be worse off after trade. Moreover, the world as a whole can be worse off with trade. Hence lump-sum transfers cannot always make both countries better off.*

Numerical simulations provided in Appendix C show that the opening of trade does not ensure mutual *ex-post* gains from trade even if complete specialization prevails in both countries. Hence, gains from specialization are not always strong enough to outweigh the psychological bias. A country can regret free trade commitment when it is based on *ex-ante* welfare analysis.

Simulation 1 (i.e. $\overline{\delta}_O = 8$ and $\overline{\delta}_P = 2$) describes the case of a worldwide optimism. When all managers are optimistic, the relative price of commodity R is not high enough to reward the risk and entrepreneurs have *ex-post* regret. Therefore, it is the country that ends up specializing in the risky activity (i.e. the more optimistic country) that is likely to lose from trade. The reversed case of a worldwide pessimism is illustrated by simulation 2 (i.e. $\overline{\delta}_O = 0.8$ and $\overline{\delta}_P = 0.2$). In equilibrium, the relative price of commodity R is now so high that managers in the certain activity do suffer *ex-post* regret. Therefore, the pessimistic country specialized in the certain commodity is likely to lose from trade. A third case is pointed out where there is an optimistic country ($\overline{\delta}_O = 4$) and a pessimistic country ($\overline{\delta}_P = 0.5$). This case is more complicated because country O or country P might loose from trade. Which country is likely to have *ex-post* regret depends on demand conditions since each country would benefit from a large demand for the commodity they specialize in. Precisely, simulation 3 shows that country O is worse off after trade if the demand for commodity R is low ($b < 0.4$) while country P is worse off the demand for commodity R is high ($b > 0.53$).

Moreover, the increase in welfare of one country does not always outweigh the decrease experimented by the other: the world can be worse off with trade. According to the Hicksian compensation theory, the compensated income R_J is such that country J achieves the same level of utility given the price change from p^a to p^*: $U_J^* \left(p^*, y_J^* + R_J \right) = U_J^* \left(p_J^a, y_J^a \right)$. Then we have $R_J = \left(p^* / p_J^a \right)^b \times y_J^a - y_J^*$ for each $J = O, P$ and the world welfare decreases when $\sum_J R_J > 0$. For example, when $\overline{\delta}_O = 3$ and $\overline{\delta}_P = 1.5$, the world welfare decreases if $b = 0.275$. In this case, specializations are complete and we have $R_O = 0.29$ $R_P = -0.25$ so $\sum_J R_J = 0.04 > 0$.

4. Conclusion

When trade is driven by a psychological bias, *ex-ante* analysis and *ex-post* analysis can lead to opposite assessment. We showed that free trade always improves the *ex-ante* welfare but sometimes lowers the *ex-post* welfare. Free trade can amplify the autarky distortions whatever induced by optimism or pessimism. These results have policy implications. If free trade commitment is based on *ex-ante* welfare, it appears that a country can regret this decision when *ex-post* welfare will decrease. This opens the door to protectionism unless this is a way to correct the psychological bias.

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Appendix

A. Income effect (IE) and price effect (PE) resulting from the opening of trade

	Country O	Country P
IE_J	$\begin{cases} \ln(1+b-b\bar{\delta}_O) & \text{if} \quad b \leq \dfrac{1}{1+\bar{\delta}_O} \\ \ln b - \ln(1-b) + \ln\left(1-b+b\bar{\delta}_O\right) & \text{if} \quad \dfrac{1}{1+\bar{\delta}_O} < b < \dfrac{1}{1+\bar{\delta}_P} \\ \ln\left(1-b+b\bar{\delta}_O\right) - \ln\bar{\delta}_P & \text{if} \quad b \geq \dfrac{1}{1+\bar{\delta}_P} \end{cases}$	$\begin{cases} \ln(1-b+b\bar{\delta}_P) & \text{if} \quad b \leq \dfrac{1}{1+\bar{\delta}_O} \\ \ln(1-b+b\bar{\delta}_P) & \text{if} \quad \dfrac{1}{1+\bar{\delta}_O} < b < \dfrac{1}{1+\bar{\delta}_P} \\ \ln\left[2-b-\dfrac{(1-b)}{\bar{\delta}_P}\right] & \text{if} \quad b \geq \dfrac{1}{1+\bar{\delta}_P} \end{cases}$
PE_J	$\begin{cases} 0 & \text{if} \quad b \leq \dfrac{1}{1+\bar{\delta}_O} \\ b\ln(1-b) - b\ln b - b\ln\bar{\delta}_O & \text{if} \quad \dfrac{1}{1+\bar{\delta}_O} < b < \dfrac{1}{1+\bar{\delta}_P} \\ b\ln\bar{\delta}_P - b\ln\bar{\delta}_O & \text{if} \quad b \geq \dfrac{1}{1+\bar{\delta}_P} \end{cases}$	$\begin{cases} b\ln\bar{\delta}_O - b\ln\bar{\delta}_P & \text{if} \quad b \leq \dfrac{1}{1+\bar{\delta}_O} \\ b\ln(1-b) - b\ln(b\bar{\delta}_P) & \text{if} \quad \dfrac{1}{1+\bar{\delta}_O} < b < \dfrac{1}{1+\bar{\delta}_P} \\ 0 & \text{if} \quad b \geq \dfrac{1}{1+\bar{\delta}_P} \end{cases}$

B. Proof of proposition 2

When managers are optimistic ($\bar{\delta}_O > \bar{\delta}_P > 1$), the price effect and the income effect are both positive for country P (see Appendix A). Therefore, country P is better off with the opening of trade.

When managers are pessimistic ($\bar{\delta}_P < \bar{\delta}_O < 1$), let us show that the income effect of country O always outweighs the price effect. Let us define:

$$h(\bar{\delta}_O) = IE_O + PE_O = \begin{cases} \ln(1+b-b\bar{\delta}_O) & \text{if} \quad b \leq \dfrac{1}{1+\bar{\delta}_O} \\ (1-b)[\ln b - \ln(1-b)] + \ln\left(1-b+b\bar{\delta}_O\right) - b\ln\bar{\delta}_O & \text{if} \quad \dfrac{1}{1+\bar{\delta}_O} < b < \dfrac{1}{1+\bar{\delta}_P} \\ \ln\left(1-b+b\bar{\delta}_O\right) - (1-b)\ln\bar{\delta}_P - b\ln\bar{\delta}_O & \text{if} \quad b \geq \dfrac{1}{1+\bar{\delta}_P} \end{cases}$$

For any given b, $h(\bar{\delta}_O)$ is decreasing in $\bar{\delta}_O$ on the interval $]0,1]$.

   a) For $b \leq \dfrac{1}{1+\bar{\delta}_O}$ we have $h'(\bar{\delta}_O) = -\dfrac{b}{\bar{\delta}_O} < 0$.

   b) For $b > \dfrac{1}{1+\bar{\delta}_O}$ we have $h'(\bar{\delta}_O) = -\dfrac{b(1-b)(\bar{\delta}_O - 1)}{\bar{\delta}_O \times (1-b+b\bar{\delta}_O)} \leq 0$.
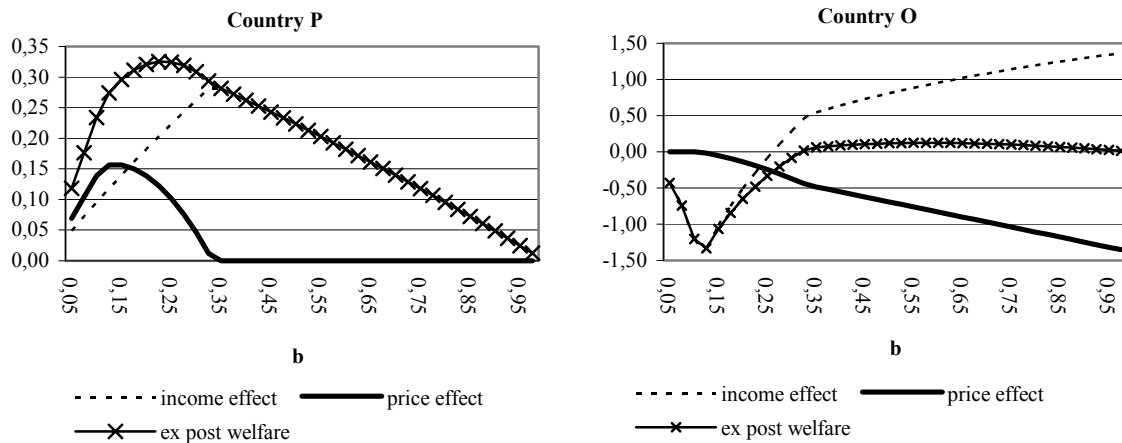
Moreover, for all $b \in \,]0,1[$ we have $h(1) \geq 0$.

a) For $b \leq \dfrac{1}{1+\overline{\delta}_O}$ we have $h(1) = 0$.

b) For $\dfrac{1}{1+\overline{\delta}_O} < b < \dfrac{1}{1+\overline{\delta}_P}$ we have $h(1) = (1-b)\big[\ln b - \ln(1-b)\big] > 0$ since $b > \dfrac{1}{1+\overline{\delta}_O}$ implies that $b > 0.5$ when $\overline{\delta}_O < 1$.

c) For $b \geq \dfrac{1}{1+\overline{\delta}_P}$ we have $h(1) = -(1-b)\ln \overline{\delta}_P > 0$ since $\overline{\delta}_P < \overline{\delta}_O < 1$.

This establishes that $h(\overline{\delta}_O)$ is strictly decreasing and positive on the interval $]0,1[$. ∎
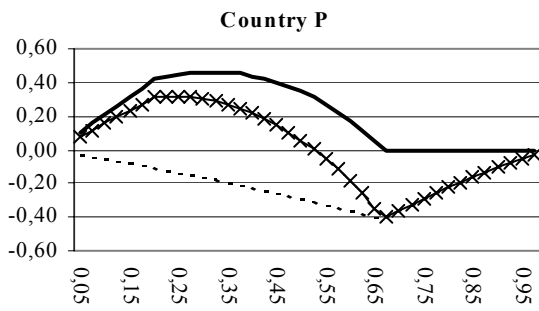
C. Numerical illustrations

Simulation 1. The effect of free trade on ex-post welfare with $\overline{\delta}_O = 8$ and $\overline{\delta}_P = 2$

Simulation 2. The effect of free trade on ex-post welfare with $\overline{\delta}_O = 0.8$ and $\overline{\delta}_P = 0.2$
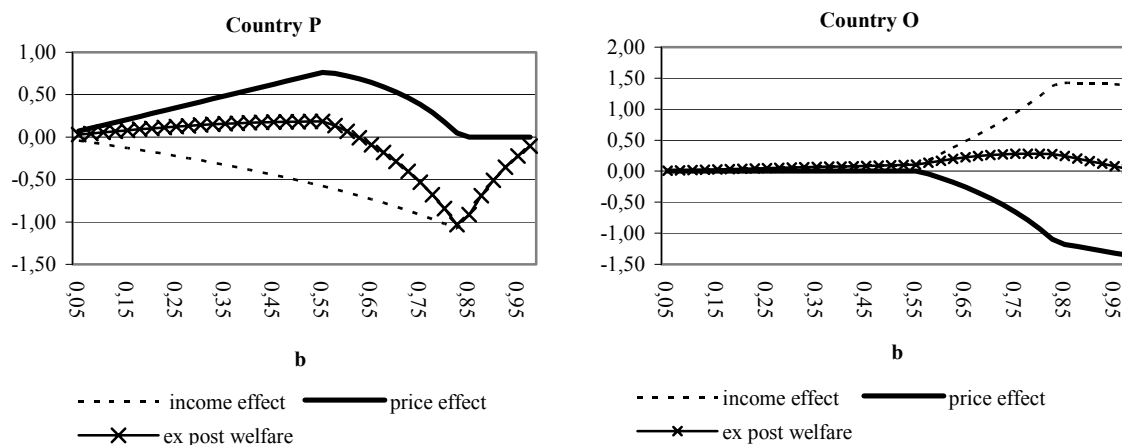
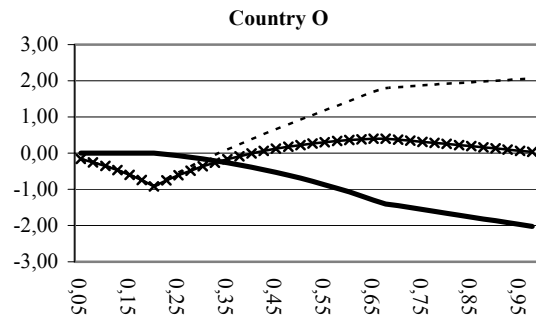*Simulation 3. The effect of free trade on ex-post welfare with* $\bar{\delta}_O = 4$ *and* $\bar{\delta}_P = 0.5$