Tourism, Jobs, Capital 
Accumulation and the Economy: 
A Dynamic Analysis
Chi-Chur Chao, Bharat R. Hazari, Jean-Pierre Laffargue, Pasquale M. Sgro, and Eden S. H. Yu

NOTA DI LAVORO 136.2005

NOVEMBER 2005

NRM – Natural Resources Management

Chi-Chur Chao, Department of Economics, Chinese University of Hong Kong and Deakin Business School, Deakin University, Australia
Bharat R. Hazari, Deakin Business School, Deakin University, Australia
Jean-Pierre Laffargue, CEPREMAP, France
Pasquale M. Sgro, Deakin Business School, Deakin University, Australia
Eden S. H. Yu, Department of Economics and Finance, City University of Hong Kong

This paper can be downloaded without charge at:
The Fondazione Eni Enrico Mattei Note di Lavoro Series Index:
http://www.feem.it/Feem/Pub/Publications/WPapers/default.htm
Social Science Research Network Electronic Paper Collection:
http://ssrn.com/abstract=855904

The opinions expressed in this paper do not necessarily reflect the position of Fondazione Eni Enrico Mattei
Corso Magenta, 63, 20123 Milano (I), web site: www.feem.it, e-mail: working.papers@feem.it
Tourism, Jobs, Capital Accumulation and the Economy: A Dynamic Analysis

Summary
This paper examines the effects of tourism in a dynamic model of trade on unemployment, capital accumulation and resident welfare. A tourism boom improves the terms of trade, increases labor employment, but lowers capital accumulation. The reduction in the capital stock depends on the degree of factor intensity. When the traded sector is weakly capital intensive, the expansion of tourism improves welfare. However, when the traded sector is strongly capital intensive, the fall in capital can be a dominant factor in lowering national welfare. This dynamic immiserizing result of tourism on resident welfare is confirmed by simulations on German data.

Keywords: Tourism, Employment, Capital accumulation, Welfare

JEL Classification: O10, F11

This paper was presented at the Second International Conference on "Tourism and Sustainable Economic Development - Macro and Micro Economic Issues" jointly organised by CRENoS (Università di Cagliari and Sassari, Italy) and Fondazione Eni Enrico Mattei, Italy, and supported by the World Bank, Chia, Italy, 16-17 September 2005.

Address for correspondence:

Pasquale M. Sgro
Deakin Business School
Deakin University
Malvern, Victoria 3144
Australia
E-mail: sgro@deakin.edu.au
1. Introduction

Tourism is a growing and important industry in both developed and developing countries. It is also an important source of earning foreign exchange and provides employment opportunities for domestic labor. Generally, tourist consumption in the receiving country is predominantly of non-traded goods and services. This type of consumption can be very significant in economies suffering a cyclical downturn in their traded-goods sector in times of recession. The recent recovery of the Hong Kong economy is an excellent example of tourism-led growth with job creation. The restructuring and relocation of manufacturing processes to China in the past two decades has resulted in unemployment of unskilled workers in Hong Kong. The Asian financial crisis in 1997 and the SARS outbreak in 2003 had made the situation even worse, and the unemployment rate in Hong Kong reached more than 7 per cent. Since April 2003, China allowed individuals from selected cities to visit Hong Kong. This resulted in tourism growth. About four million Chinese tourists came to Hong Kong, which in turn created job opportunities and substantially reduced unemployment.¹

Tourism research has concentrated on understanding the effects of tourism on the economy both in distortion and distortion-free models. In the latter models,² a tourism boom via a demand push raises the relative price of the non-traded good. Since tourism is essentially exports of services, this gain in the “tertiary terms of trade” improves residents’ welfare. Subsequent research has extended the analysis of the effects of tourism in two directions. The first direction is to examine static economies with distortions. Hazari, et al. (2003) and Nowak et al. (2003) are examples of this line of research, where the former analyzes the welfare effect of tourism in a Harris-Todaro (1970) economy, while the latter introduces increasing returns to scale in the economy. The second direction of research is the analysis of tourism in dynamic models of trade. Using a one-sector growth model, Hazari and Sgro (1995) found that tourism without monopoly power in trade is necessarily welfare improving. Recently, Chao, et al. (2005) demonstrated that an expansion of tourism may result in capital decumulation, thereby lowering welfare in a two-
sector model with a specific type of distortion, namely, capital-generating externality. However, the relationship between tourism and employment remains unexplored in the literature. Does an expansion in tourism create more jobs in the local economy, reduce the unemployment rate and hence improve workers’ welfare? We explore this problem in a uniform minimum-wage dynamic economy, and extend the framework by incorporating capital adjustments in the long run. The assumption of a minimum wage is captured by wage indexation. We find that because of the nature of labor intensity of the tourism industry, the expansion of tourism raises demand for labor and increases employment. Nonetheless, the expansion of the tourism sector may lead to capital decumulation in other traded sectors. When the traded sector is strongly capital intensive relative to the non-traded good sector, the fall in the capital stock plays a dominant role that can lower economic welfare. Therefore, in evaluating the effectiveness of tourism to the economy, a trade-off exists between the gain in employment and the loss in capital decumulation. German data is used to simulate these results.

The structure of this paper is as follows. Section 2 sets out a dynamic model with capital accumulation for examining the effects of tourism on the relative price of the non-traded good, labor employment, capital accumulation and welfare in the short and long runs. Section 3 provides numerical simulations for the effects of tourism on the economy. Section 4 outlines the main findings and conclusions.

2. The Model

We consider an open economy that produces two goods, a traded good $X$ and a non-traded good $Y$, with production functions: $X = X(L_X, K_X, V_X)$ and $Y = Y(L_Y, K_Y, V_Y)$. The variables $L_i$, $K_i$, and $V_i$ denote the allocation of labor and capital and specific factor employed in sector $i$, $i = X, Y$. While both labor and capital are perfectly mobile between sectors, there are specific factors to each sector. So, the model considered is a hybrid of the Heckscher-Ohlin and the specific-factors model. Commodity $X$ has been chosen as the numeraire. The relative price of the non-
traded good Y is denoted by p. The production structure of the model is expressed by the revenue function: 

\[ R(1, p, K, L) = \max \{X(L, K, V_x) + pY(L, K, V_Y) : L_x + L_y = L, K_x + K_y = K\}, \]

where \( L \) is the actual level of labor employment and \( K \) is the stock of capital in the economy. The fixed endowments of specific factors \( V_i \) have been suppressed in the revenue function. Denoting subscripts as partial derivatives and employing the envelope property, it follows: \( R_p = Y \), being the output of good Y, and \( R_{pp} > 0 \), expressing the positive supply curve. Stability condition of this system requires that sector Y is labor intensive relative to sector X. This gives: \( R_{pl} > 0 \) and \( R_{pk} < 0 \), by the Rybczynski theorem. The rental on capital \( r \) equals \( R_K \). The specificity of factors \( V_i \) results in \( R_{KK} < 0 \) and \( R_{KL} > 0 \). Let \( w \) denote the wage rate, then the level of total employment is determined by

\[ R_L(1, p, K, L) = w, \]

(1)

where \( R_{LL} < 0 \) due to diminishing returns of labor. Note that the wage rate is set by the government according to the goods prices, i.e., \( w = w(1, p) \), with \( \partial w/\partial p > 0 \) and \( (p/w)(\partial w/\partial p) \leq 1 \). This real wage indexation results in economy-wide unemployment, measured by \( \overline{L} - L \), where \( \overline{L} \) is the exogenously given labor endowment in the economy.

We now consider the demand side of the economy. Domestic residents consume both goods, \( C_X \) and \( C_Y \), while foreign tourists demand only the non-traded good Y. Let \( D_T(p, T) \) be the tourists’ demand for good Y, where \( T \) is a shift parameter capturing the tastes and other exogenously given variables, for example, foreign income, with \( \partial D_Y/\partial T > 0 \). The market-clearing condition for the non-traded good requires the equality of demand (where this consists of domestic and tourist demand) and supply:

\[ C_Y + D_T(p, T) = R_Y(1, p, K, L). \]

(2)

This equation determines the relative price of the non-traded good, \( p \).

In a dynamic setting, domestic savings out of consumption of goods X and Y are used for capital accumulation:
\[ \dot{K} = R(1, p, K, L) - C_X - pC_Y, \]  

(3)

where the dot over the variable denotes its time derivative. Note that in exchange for tourism exports, capital is imported at a given world price which is normalized to unity.

Under the budget constraint (3), the domestic residents maximize the present value of their instantaneous utility, \( U(\cdot) \). The overall welfare \( W \) is therefore:

\[ W = \int_0^\infty U(C_X, C_Y) e^{-\rho t} dt, \]

(4)

where \( \rho \) represents the rate of time preference. Let \( \lambda \) denote the shadow price of capital in the economy. The first-order conditions with respect to \( C_X \) and \( C_Y \) are:

\[ U_X(C_X, C_Y) = \lambda, \]

(5)

\[ U_Y(C_X, C_Y) = \lambda p. \]

(6)

where \( U_X \) and \( U_Y \) denote marginal utilities of consuming good \( X \) and \( Y \) respectively.

In addition, the evolution of the shadow price of capital is governed by the following dynamic equation:

\[ \dot{\lambda} = \lambda [\rho - R_X(1, p, K, L)], \]

(7)

which is a function of the difference between the subjective rate of time preference and the return to capital.

Using the above framework, we can examine the resource allocation and welfare effects of tourism on the economy in the short and long runs.

(a) Short-run equilibrium

In the short-run equilibrium, the initial amount of capital \( K \) is given by \( K_0 \) as its shadow price is fixed.\(^8\) For a given value of the tourism parameter \( T \), the system can be solved for \( L, p, C_X \) and \( C_Y \) by using equations (1), (2), (5) and (6) as functions of \( K, \lambda \) and \( T \); \( L = L(K, \lambda, T); p = p(K, \lambda, T), C_X = C_X(K, \lambda, T) \) and \( C_Y = C_Y(K, \lambda, T) \). An increase in capital, \( K \), raises the
productivity of labor and hence labor employment ($\partial L/\partial K > 0$). However, the increase in capital lowers the supply of good $Y$ by the Rybczynski effect, which raises its price ($\partial p/\partial K > 0$). This in turn lowers the demand for good $Y$ by domestic residents ($\partial C_y/\partial K < 0$). Furthermore, for $U_{xy} > 0$ the decreased consumption of good $Y$ lowers marginal utility of good $X$, which reduces the demand for good $X$ ($\partial C_x/\partial K < 0$). Similarly, a rise in the shadow price of capital lowers the demand for labor in production ($\partial L/\partial \lambda < 0$) and the demand for goods in consumption ($\partial C_x/\partial \lambda < 0$ and $\partial C_y/\partial \lambda < 0$). This results in the fall in the relative price of the non-traded good ($\partial p/\partial \lambda < 0$).

In addition, a rise in tourism increases the demand for the non-traded good and hence its price ($\partial p/\partial T > 0$). This leads to an increase in employment in the economy, $\partial L/\partial T > 0$. However, the higher price also reduces the demand for both goods by domestic residents ($\partial C_x/\partial T < 0$ and $\partial C_y/\partial T < 0$).9

(b) Dynamics

We can utilize the short-run comparative-static results to characterize the local dynamics of the model. The dynamics of domestic capital accumulation in equation (3) and its shadow prices in equation (7) are:

$$\dot{K} = R[1, p(K, \lambda, T), K, L(K, \lambda, T)] - C_x(K, \lambda, T) - p(K, \lambda, T)C_y(K, \lambda, T), \quad (8)$$

$$\dot{\lambda} = \lambda \{\rho - R_{KL}[1, p(K, \lambda, T), K, L(K, \lambda, T)]\}. \quad (9)$$

Taking a linear approximation of the above system around the equilibrium, we have:

$$\begin{bmatrix} \dot{K} \\ \dot{\lambda} \end{bmatrix} = \begin{bmatrix} A & B \\ M & N \end{bmatrix} \begin{bmatrix} K - \tilde{K} \\ \lambda - \tilde{\lambda} \end{bmatrix} \quad (10)$$

where a tilde (−) over a variable denotes its steady-state level. Note that $A = R_K + R_{KL}(\partial L/\partial K) + D_A(\partial p/\partial K) - \partial C/\partial K$, $B = R_{KL}(\partial L/\partial \lambda) + D_A(\partial p/\partial \lambda) - \partial C/\partial \lambda$, $M = -\lambda[R_{KK} + R_{KL}(\partial L/\partial K) + R_{KL}(\partial p/\partial K)]$ and $N = -\lambda[R_{KL}(\partial p/\partial \lambda) + R_{KL}(\partial L/\partial \lambda)]$.10 The signs of $A$, $B$, $M$ and $N$ are in general indeterminate.
However, for our purposes, $A > 0$, $M > 0$ and $N < 0$ when $R_{kp} < 0$ and $R_{lp} > \partial w/\partial p$, i.e., the non-traded good $Y$ is labor intensive, and $R_{LL}/R_{LK} < R_{pL}/R_{pk} < R_{KL}/R_{kk}$. Furthermore, $B > 0$ when $\eta = -(\partial D_Y/\partial p)(p/D_Y) \geq 1$, i.e., the price elasticity of the demand for good $Y$ by tourists is elastic.

![Figure 1. An expansion of tourism](image)

The schedules of $\dot{K} = 0$ and $\dot{\lambda} = 0$ are depicted in Figure 1, with the slopes of $d\lambda/dK|_{\lambda} = - A/B < 0$ and $d\lambda/dK|_{\dot{\lambda}} = - M/N > 0$. Under these conditions, the determinant of the above coefficient matrix is negative and the steady-state equilibrium is at point $E$ which is a saddle point with one negative and one positive eigenvalue. For the given initial value of the capital stock $K_0$, the
we can obtain from (10) the following solutions for the capital stock and its shadow price around their steady-state values:

$$K_t = K^* + (K_0 - K^*)e^{\mu t}, \quad (11)$$

$$\lambda_t = \lambda^* + \theta(K_t - K^*), \quad (12)$$

where $\theta = (\mu - A)/B < 0$, and $\mu$ is the negative eigenvalue in equation (10). The stable arm of the relation between $K$ and $\lambda$, as shown by equation (12) and also depicted by the SS schedule in Figure 1, indicates that a decrease in $K$ leads to an increase in its shadow price $\lambda$, and vice versa.

(c) Steady State

The long-run equilibrium is obtained by using the short-run equilibrium conditions in equations (1), (2), (4) and (5), together with no adjustments in the capital stock and its shadow price in equations (3) and (7) as:

$$R(1, \bar{p}, \tilde{K}, \tilde{L}) - \bar{C}_x - \bar{p} \tilde{C}_y = 0, \quad (13)$$

$$R_\kappa(1, \bar{p}, \tilde{K}, \tilde{L}) = \rho. \quad (14)$$

Equations (1), (2), (4), (5), (13) and (14) contain six endogenous variables, $\tilde{L}, \tilde{p}, \tilde{C}_x, \tilde{C}_y, \tilde{K}$ and $\tilde{\lambda}$, along with a tourism parameter, $T$. This system can be used to solve for the impact of tourism in the long run. An increase in tourism on the long-run price of the non-traded good $Y$ is:

$$\frac{d\bar{p}}{dT} = S(\partial D/\partial T)(p^2U_{xx} + U_{yy} - 2pU_{xy})/\Delta > 0, \quad (15)$$

where $U_{xx} < 0$, $U_{yy} < 0$, and $\Delta < 0$. Note that $S = R_{kk}R_{ll} - R_{kl}^2 > 0$ by the concavity of the production functions. Hence, an increase in tourism will necessarily improve the tertiary terms of trade.

In addition, from equations (1) and (14), we can obtain the long-run effects of tourism on the capital stock and labor employment, as follows:
\[
\frac{d\tilde{L}}{dT} = R_{pK}R_{KK}(R_{KL}/R_{KK} - R_{pl}/R_{pk})/S(\tilde{p} / dT) > 0, \tag{16}
\]
\[
\frac{d\tilde{K}}{dT} = - [R_{pK}R_{KL}(R_{LL}/R_{LK} - R_{pl}/R_{pk})/S][\tilde{p} / dT] < 0, \tag{17}
\]

where recalling that \( R_{LL}/R_{LK} < R_{pl}/R_{pk} < R_{KL}/R_{KK} \) for stability. An increase in tourism will increase employment in the long run, but at the expense of capital accumulation in the economy. The reduction in the capital stock can be seen in Figure 1. A boom in tourism shifts both schedules of \( \dot{K} = 0 \) and \( \dot{\lambda} = 0 \) to the left.\(^{12} \) Since the capital stock is given at time 0, the adjustment path takes the system from point \( E \) to point \( F \). This immediately leads to a fall in the shadow price of capital,\(^{13} \) and consequent reductions in capital accumulation from point \( F \) to a new equilibrium at point \( E' \).\(^{14} \)

\( (d) \) Welfare

We are now in a position to examine the effect of tourism on overall welfare of the economy. Total welfare in equation (4) can be obtained from the sum of the instantaneous utility \( Z = U(C_X, C_Y) \). Following Turnovsky (1999, p. 138), the adjustment path of \( Z \) is: \( Z_t = \tilde{Z} + [Z(0) - \tilde{Z}]e^{\mu t} \), where \( Z(0) \) denotes the utility at time 0. However, total welfare is \( W = \tilde{Z} / \rho + [Z(0) - \tilde{Z}] / (\rho - \mu) \), and the welfare change is: \( dW = (\mu/\rho) [dZ(0) - (\mu/\rho)d\tilde{Z}] + [dL(0)/dT - (\mu/\rho)(d\tilde{L}/dT)] + R_{L}[dL(0)/dT - (\mu/\rho)(d\tilde{L}/dT)] \)

\[
\frac{dW}{dT} = \left[ \frac{\lambda}{(\rho - \mu)} \right] \{ D_{L}[dp(0)/dT - (\mu/\rho)(d\tilde{p} / dT)] + R_{L}[dL(0)/dT - (\mu/\rho)(d\tilde{L} / dT)] \}
\]

\( - (\mu/\rho)R_{K}(d\tilde{K} / dT) \}, \tag{18} \]

where \( p(0) \) and \( L(0) \) denote the relative price of the non-traded good and labor employment at time 0. Since the capital stock is given at time 0, a tourist boom immediately increases the demand for good \( Y \) and hence its price. As a consequence, higher labor demand is needed for
producing more good $Y$. These results can be derived from using equations (1), (2), (5), (6) and (13) as

$$\frac{dp(0)}{dT} = - \left( \frac{\partial D_Y}{\partial T} R_{LL} (2pU_{XY} - p^2U_{XX} - U_{YY}) \right) / H > 0, \quad (19)$$

$$\frac{dL(0)}{dT} = - \left( \frac{R_{pL}}{R_{LL}} \right) \left( \frac{dp(0)}{dT} \right) > 0, \quad (20)$$

where $H > 0$.\textsuperscript{15}

The welfare effects of tourism in equation (18) depend on the changes in the terms of trade, labor employment and capital accumulation. An expansion of tourism increases the initial and steady-state relative price of the non-traded good, $Y$, which yields a gain in the terms of trade as shown in the first term in the curly bracket in equation (18). While the static terms-of-trade effect is well known in the literature, the impact of tourism on labor employment and capital accumulation is generally not mentioned in the literature. These are of critical importance in analyzing economic welfare. As indicated in second term of equation (18), tourism can generate more labor employment in the short and the long run via the higher price of the non-traded good. However, the higher price of the non-traded good can reduce the demand for capital, causing a welfare loss as shown by the third term in equation (18). Due to these conflicting forces, the welfare effect of tourism is in general ambiguous. To illustrate the strength of our results we will use simulations to ascertain the welfare effects of tourism both in the short and the long run.

3. Simulations

To calibrate the effects of an increase in tourism on the endogenous variables of the economy, we need to specific functional forms for the utility and production functions.

(a) Specifications

We assume that the production of the traded and non-traded goods takes place with the help of Cobb-Douglas production functions:
\[ X = A L_X^{a_x} K_X^{a_x} V_X^{1-a_x-a_z}, \]  
\[ Y = B L_Y^{\beta_y} K_Y^{\beta_y} V_Y^{1-\beta_y-\beta_z}, \]

where \( A \) and \( B \) are the constant technology factors, and \( \alpha_i \) and \( \beta_i \) are respectively the ith factor shares in productions of goods \( X \) and \( Y \). Total employment for sectors \( X \) and \( Y \) in the economy is given by

\[ L = L_X + L_Y. \]

Similarly, capital allocation between sectors is:

\[ K_i = K_X + K_Y. \]

Note that total capital is inherited from the past and is fixed in the short run, but it can be freely allocated between both sectors. This is the reason why total capital is indexed by -1 (it is predetermined in the short-run equilibrium) and capital allocation in each sector is not indexed.

Given the wage rate \( w \), the rental rate \( r \) and the relative price of the non-traded good \( p \), the production sector solves the program: \( \text{Max } X + pY - w(L_X + L_Y) - r(K_X + K_Y) \), subject to \( X = A L_X^{a_x} K_X^{a_x} V_X^{1} \) and \( Y = B L_Y^{\beta_y} K_Y^{\beta_y} V_Y^{1} \). Here, the specific factors \( V_X \) and \( V_Y \) are normalized to unity. The first-order conditions with respect to \( L_i \) and \( K_i \) yield equilibrium allocation of labor and capital between sectors:

\[ w = \alpha_1 A(K_X / L_X)^{a_x} L_X^{1-a_x-a_z} = p\beta_1 B(K_Y / L_Y)^{\beta_y} L_Y^{1-\beta_y-\beta_z}, \]  
\[ r = \alpha_2 A(L_X / K_X)^{a_x} K_X^{1-a_x-a_z} = p\beta_2 B(L_Y / K_Y)^{\beta_y} K_Y^{1-\beta_y-\beta_z}. \]

The resulting factor-price frontiers can be deduced from equations (25) and (26):

\[ (w / \alpha_1)^{1-a_x} (r / \alpha_2)^{a_x} L_X^{1-a_x-a_z} = A, \]  
\[ (w / \beta_1)^{1-\beta_y} (r / \beta_2)^{\beta_y} L_Y^{1-\beta_y-\beta_z} = pB. \]

In addition, real wage, denoted by \( w_c \), in the economy is assumed to be rigid in the sense that it is indexed to the price of the consumption goods \( p_c \):

\[ w_c = w/p_c. \]
where $p_c$ is defined in equation (32).

On the demand side of the economy, we utilize the CES functional form for the instantaneous utility function of domestic households:

$$U = \left[ b^{1/(1+\sigma)} C_X^{\sigma/(1+\sigma)} + \tilde{b}^{\sigma/(1+\sigma)} C_Y^{\sigma/(1+\sigma)} \right]^{(1+1/\sigma)(1-\gamma)/(1 - \gamma)}.$$  \hspace{1cm} (30)

where $b \in [0, 1]$ and $\tilde{b} = 1 - b$ are the parameters, $\gamma$ expresses the index of relative risk aversion and $\sigma$ captures the elasticity of substitution between the two goods with $1 + \sigma \geq 0$. From the first-order conditions of utility maximization, we derive

$$b C_Y / b C_X = 1/p^{1+\sigma}.$$  \hspace{1cm} (31)

Let $C = \left[ b^{1/(1+\sigma)} C_X^{\sigma/(1+\sigma)} + \tilde{b}^{\sigma/(1+\sigma)} C_Y^{\sigma/(1+\sigma)} \right]^{(1+1/\sigma)}$ denote aggregate consumption. Then by using equation (31) we obtain that $C = (C_X/b)(b + \tilde{b} p^{\sigma(1+\sigma)}/p^{1+\sigma})$. The relative price of the consumption aggregate is then defined by $p_c C = C_X + p C_Y$, which can be solved for $p_c$ as

$$p_c = (b + \tilde{b} p^{\sigma(1+\sigma)})^{-1/\sigma}. \hspace{1cm} (32)$$

Therefore, the current utility of domestic households can be expressed as:

$$U(C) = C^{(1-\gamma)/(1 - \gamma)} = \left[ (C_X/b)(b + \tilde{b} p^{\sigma(1+\sigma)}) \right]^{1+1/\sigma}.$$

The model is closed by using the market-clearing condition for the non-traded good $Y$:

$$C_Y + D_Y = Y, \hspace{1cm} (33)$$

and the demand for the non-traded good by tourists is specified as

$$D_Y = T/p^\eta, \hspace{1cm} (34)$$

where $\eta$ measures the price elasticity of demand for good $Y$ by tourists. Tourists spending $T$, measured in terms of the traded good, is exogenous and tourists consume only non-traded good.

Finally, the budget constraint for each period is:

$$K - K_1 + C_X + p C_Y = X + p Y. \hspace{1cm} (35)$$
Note that the balance of payments is in equilibrium for each period. From equations (33) and (35), we can deduce that: \( K - K_{-1} + C_X - X = pD_Y \). That is, the excess demand for capital and the traded good is financed by income receipts from tourism.

Total welfare of domestic residents is the discounted sum of the instantaneous utility and it can be written as: 
\[
W = \sum_{t=0}^{\infty} (1 - \rho)^t [C_X (b + \bar{b} p^{-\sigma})^{1+1/\sigma}]^{1-\gamma} (1 - \gamma).
\]
This function is maximised relatively to capital and the consumption of the traded good under the series of budget constraints: 
\[
K - K_{-1} + C_X (b + \bar{b} p^{-\sigma})/b = X + pY = w(L_X + L_Y) + rK_{-1} + v_XV_X + v_YV_Y.
\]
Solving this maximisation program with respect to \( C_X \) and \( K \), we obtain the first-order conditions: 
\[
(1 - \rho)^t C_X^{-\gamma} (b + \bar{b} p^{-\sigma})^{1+1/\sigma (1+1)} = \delta b \quad \text{and} \quad \delta - \delta_1 (1 + r_{-1}) = 0 \] where \( \delta \) is the Langrange multiplier.

After the elimination of \( \delta \) and \( \delta_1 \), we have
\[
(1 + r_{-1})(1 - \rho) = (C_X/C_{X+1})^{-\gamma} [(b + \bar{b} p^{-\sigma}) (b + \bar{b} p^{-\sigma})]^{1+1/\sigma (1+1)}.
\]  
(36)  

(b) Calibrations  

Equations (21) – (36) consist of sixteen endogenous variables and a shift parameter of tourist spending \( T \) for the economy. We utilize the German data to calibrate the short- and long-run impact of an increase in tourism on the economy. It is assumed that tourists’ spending is 0 in the reference steady state. We choose \( p = 0.9488, X + pY = 1.3909 \) and \( L = 27.27 \), which represent the averages values of these variables for Germany for the period 1996-2002. Units are in trillion of 1995 euros and in millions of persons. We set: \( T = 0, \sigma = -0.5, b = 1/3, \rho = 0.05, \alpha_1 = 0.30, \alpha_2 = 0.50, \beta_1 = 0.5, \beta_2 = 0.10, \lambda = 0.5 \) and \( \eta = 1.16 \). Note that the labor intensity of good \( Y \) is captured by the chosen values of \( \alpha_i \) and \( \beta_i \). The steady-state values of the sixteen endogenous variables can be then computed according to: \( D_Y = 0, X = (X + pY)/(1 + (\bar{b}/b)p^{-\sigma}), Y = (X + pY - X)/p, C_Y = Y, C_X = X, r = 1/(1 - \rho) - 1, L_Y = [\beta p p Y (\alpha X + \beta p Y)] L, L = L_X + L_Y, K_Y = \beta p Y / r, B = Y/[L_y^\beta K_y^{\beta_2}], w = p \beta_1 B^{1/(1-\beta_1)} (p \beta_2 / r)^{\beta_1/(1-\beta_1)} L_y^{(1-\beta_1 - \beta_2)/(1-\beta_1)} K_Y = \alpha_2 X / r, A = X/(L_X^\alpha K_X^{\alpha_2}), U = \).
\[ b^{1/(1+\sigma)}C_X^{\sigma/(1+\sigma)} + b^{1/(1+\sigma)}C_Y^{\sigma/(1+\sigma)} \left( 1 - \gamma \right), K = K_X + K_Y, \text{ and } p_c = (b + \beta p^\sigma)^{1/\sigma}. \]

The reference steady state values are therefore: 

- \( C_X = 0.4718 \), \( C_Y = 0.9687 \), \( D_Y = 0 \), \( K = 6.2285 \), \( K_X = 4.4821 \), \( K_Y = 1.7464 \), \( L = 27.27 \), \( L_X = 6.4212 \), \( L_Y = 20.8488 \), \( p = 0.9488 \), \( p_c = 0.9657 \), \( r = 0.0526 \), \( U = 2.4003 \), \( w = 0.02204 \), \( X = 0.4718 \) and \( Y = 0.9687 \).

There is one anticipated variable \( C_{X,+1} \) and one predetermined variable \( K_{-1} \) in the system. The eigenvalues in the neighbourhood of the reference steady state are equal to 0.9717 and 1.092. So the local condition of existence and uniqueness are satisfied (one of the eigenvalues must be less than one and the other larger than one to get the existence and uniqueness of a solution). As we will compare sums of discounted utilities when the convergence speed to the steady state is slow, we simulated the model over 250 periods.\(^{17}\)

As for reference simulations, we let tourist spending \( T \) to increase from 0 to 0.01 (which means by 10 billions euros, the German value-added in non-tradable goods being 982 billion euros). We obtain the short- and long-run impacts of tourism on the economy, as plotted in Figure 2:

1. \( C_X \) and \( C_Y \) immediately increase above their reference values, and then progressively decrease but \( C_Y \) ends with a level lower than its reference value.
2. \( L_X \) immediately falls and then slightly increases, while \( L_Y \) immediately rises and then slightly decreases. This gives that total employment \( L \) to rise initially and progressively decreases but stays above its reference level.
3. \( K_X \) immediately declines and continuously falls, while \( K_Y \) immediately rises and then declines. However, total \( K \) progressively decreases to a lower level.
4. \( X \) immediately decreases and then progressively decreases to a lower level, while \( Y \) immediately rises and then progressively decreases to a level which is higher than its reference value.
5. \( p \) immediately increases above its reference value, and then progressively decreases but stays above its reference value.

6. \( U \) immediately increases above its reference value, and then progressively decreases to a value that is above its reference value. The sum of discounted utilities increases from 343.6305 to 344.0061. Hence, a rise in tourism improves total welfare in the long run.

Consider next the case that the non-traded sector \( Y \) is strongly labor-intensive relative to the traded sector \( X \). For this case, we choose \( \beta_2 = 0.001 \) and leave the other parameters the same as before. The consequent eigenvalues are 0.9683 and 1.093, and the reference steady-state values are the same as in the previous case but for: \( K = 4.4996 \) and \( KY = 0.0175 \). Consider reference simulations by increasing tourist spending \( T \) from 0 to 0.01. We obtain the short- and long-run impacts of tourism, as plotted in Figure 3. Compared to the results in Figures 2 and 3, the patterns of changes in all the endogenous variables are the same. However, in Figure 3, the rise in total employment \( L \) is smaller but the fall in capital \( K \) is larger. These differences render a different effect of tourism on utility and welfare: although \( U \) immediately increases above its reference value, it progressively decreases and reaches a value below its reference value. Therefore, the sum of discounted utilities decreases from 343.6305 to 343.5839. Thus, owing to the fall in the capital stock, a rise in tourism can lower total welfare when the traded sector is strongly capital-intensive relative to the non-traded tourism sector.

4. Conclusions

Using a dynamic general-equilibrium framework, this paper has examined the short- and long-run effects of tourism on labor employment, capital accumulation and resident welfare for an open economy with unemployment via wage indexation. A tourism boom improves the terms of trade, increases labor employment, but lowers capital accumulation if the non-traded tourism sector is labor intensive relative to the other traded sector. Nonetheless, the reduction in the capital stock depends on the degree of factor intensity. When the traded sector is not strongly
capital intensive, the fall in capital would not be so severe and the expansion of tourism improves welfare. However, when the traded sector is strongly capital intensive, the fall in capital can be a dominant factor to lower total welfare. This immiserizing result of tourism on resident welfare is confirmed by the German data.
Figure 2. Effects of tourism ($\beta_2 = 0.10$)
Figure 3. Effects of Tourism ($\beta_2 = 0.001$)
Footnotes

1. The economic doldrums were halted and the GDP growth is 8.2 per cent in 2004, well above average 4.8 per cent over the past 20 years. The details can be found in the Budget Speech by the Hong Kong Financial Secretary on March 16, 2005. The simulations in this paper have been done on the basis of German data. Hong Kong data is not easily accessible. Moreover, the results are robust with regard to the choice of the country.


3. See Brecher (1974) for the minimum wage model under the Heckscher-Ohlin setting.


5. The stability analysis is provided in the Appendix.

6. Letting $c^i(w, r, v_i)$ be the $i$th sector unit cost function, by perfect competition we have: $c^i(w, r, v_i) = 1$ and $c^i(w, r, v_i) = p$, where $w$ is the fixed minimum wage and $v_i$ are the rates of return on the specific factors $V_i$. Owing to the existence of the specific factors, the capital return $r$ depends on the good price $p$ and the factor suppliers $L$ and $K$.

7. A recent study on a generalized minimum wage model can be found in Kreickemeier (2005). Also see Hatzipanayoyou and Michael (1995) and Michael and Hatzipanayoyou (1999) for endogenous labor supply.


9. Mathematical derivations of the comparative-static results are provided in the Appendix.

10. Following Brock (1996), we use $\partial C / \partial K = \partial C^x / \partial K + p(\partial C^y / \partial K)$, $\partial C / \partial \lambda = \partial C^x / \partial \lambda + p(\partial C^y / \partial \lambda)$ and $\partial C / \partial T = \partial C^x / \partial T + p(\partial C^y / \partial T)$.

11. Note that $\Delta = R_{pk}R_{kk}(R_{kk}/R_{kk} - R_{pl}/R_{pk})\{(U_{xy} - pU_{xx})[R_{1L} - p(\partial w / \partial p)](U_{xy} - pU_{xx}) + (U_{yy} - pU_{yy})(R_{pl} - \partial w / \partial p)) + R_{pk}R_{lk}(R_{pl}/R_{pk} - R_{ll}/R_{lk})[R_{lk}(U_{xy} - pU_{xx}) + R_{pk}(U_{xy} - pU_{xy})] - (U_{xy} - pU_{xx})(R_{pk}R_{lk} - R_{lk}R_{kk})(\partial w / \partial p) - (R_{ll}R_{kk} - R_{lk}^2)Q < 0$, where $Q = \lambda + D_1(\eta - 1)(U_{xy} - pU_{xx}) -
\( (\partial D\partial p)(pU_{XY} - U_{YY}) + R_{pp}(2pU_{XY} - p^2U_{XX} - U_{YY}) > 0 \) by the stability conditions: \( \eta \geq 1, R_{pl} > \partial w\partial p, R_{pk} < 0 \) and \( \frac{R_{LL}}{R_{LK}} < \frac{R_{pl}}{R_{pk}} < \frac{R_{KL}}{R_{KK}} \).

12. For holding \( \lambda \) fixed, the shifts of \( K = 0 \) and \( \lambda = 0 \) in Figure 1 are:

\[
\frac{dK}{dT}\big|_{K=0} = -\left[ RL(\partial L/\partial T) + R_{pk}(\partial p/\partial T)\right] / A < 0 \quad \text{and} \quad \frac{dK}{dT}\big|_{\lambda=\lambda} = \lambda\left[ RLK(\partial L/\partial T) + RpK(\partial p/\partial T)\right] / M < 0,
\]

where

\[
R_{LK}(\partial L/\partial T) + R_{pk}(\partial p/\partial T) = (\partial D\partial T)R_{pk}RLK[R_{pl}/R_{pk} - R_{LL}/R_{LK} - (\partial w\partial p)/R_{pk})(U_{XX}U_{YY} - U_{XY}^2) / J < 0.
\]

13. From (1), (2), (5), (6) and (13), we can obtain:

\[
\frac{d\lambda(0)}{dT} = (\partial D\partial T)\left[D_L R_{LL} - R_L(R_{pl} - \partial w\partial p)\right][U_{XX}U_{YY} - U_{XY}^2] + \lambda R_{LK}(U_{XY} - pU_{XX}) / H < 0,
\]

where

\[
H = - RLQ - R_{pl}[R_{LL}(U_{XY} - pU_{XX}) + R_{pk}(U_{YY} - pU_{XY})] + R_{pl}(U_{YY} - pU_{XY})] + R_{pl}(U_{XY} - U_{XX})(\partial w\partial p) > 0.
\]

14. The change in the steady-state value of \( \lambda \) depends on the relative shifts of the schedules of

\[
\dot{\lambda} = 0 \quad \text{and} \quad \dot{K} = 0; \quad \text{specifically,} \quad \frac{d\lambda}{d\alpha} = (\partial D\partial T)\left[dL_RL(R_{KK} - R_{LK}^2) D_L + \lambda(U_{XY} - pU_{XX})\right] +
\]

\[
(U_{XX}U_{YY} - U_{XY}^2)R_{pk}[R_{pl}R_{LK}/R_{pk} - R_{LL}/R_{LK} - (\partial w\partial p)/R_{pk}] + R_{LK}(R_{LL}/R_{KK} - R_{pl}/R_{pk} + (\partial w\partial p)/R_{pk})] / \Delta \neq 0.
\]

15. See footnote 13 for the positive sign of \( H \).

16. Putting the price elasticity different from 1 would not change the results qualitatively.

17. The model was simulated and its eigenvalues computed with the software Dynare, which was run under Matlab. Dynare was developed by Michel Juillard, and can be unloaded from the website http://www.cepremap.cnrs.fr/dynare.
References


Appendix: Short-run Comparative Statics

From (1), (2), (5) and (6), the results of the comparative statics in the short run are:

\[ \frac{\partial L}{\partial K} = -\left\{ R_p K (R_p L - \partial w / \partial p) + R_L (\partial D_f / \partial p - R_p) (U_{XX} U_{YY} - U_{XY}^2) + \lambda R_{LK} U_{XX} \right\} / J > 0, \]

\[ \frac{\partial C_X}{\partial K} = \lambda U_{XX} R_{LK} R_p (R_p L - R_{LL}/R_{LK}) / J < 0, \]

\[ \frac{\partial C_Y}{\partial K} = -\lambda U_{XX} R_{LK} R_p (R_p L - R_{LL}/R_{LK}) / J < 0, \]

\[ \frac{\partial C}{\partial K} = -R_{LK} R_p (R_p L - R_{LL}/R_{LK})(U_{XX} U_{YY} - U_{XY}^2) / J > 0, \]

\[ \frac{\partial p}{\partial K} = -R_{LL} R_p (R_p L - R_{LL}/R_{LK}) (U_{XX} U_{YY} - U_{XY}^2) / J > 0, \]

\[ \frac{\partial C}{\partial T} = -R_{LL} R_p (R_p L - R_{LL}/R_{LK}) (U_{XX} U_{YY} - U_{XY}^2) / J < 0, \]

\[ \frac{\partial p}{\partial T} = -R_{LL} R_p (R_p L - R_{LL}/R_{LK}) (U_{XX} U_{YY} - U_{XY}^2) / J > 0, \]

where \( J = \left\{ R_{pp} (R_p L - \partial w / \partial p) + R_{LL} (\partial D_f / \partial p - R_p) (U_{XX} U_{YY} - U_{XY}^2) + \lambda R_{LL} U_{XX} \right\} > 0. \) We obtain the above signs when the stability condition, \( R_{LL}/R_{LK} < R_{pp}/R_{LK} < R_{KL}/R_{KK}, \) is imposed.

Using the above results, we can obtain:

\[ B = R_L (\partial L / \partial \lambda) + D_f (\partial p / \partial \lambda) - \partial C / \partial \lambda = \{(U_{XY} - p U_{XX})[R_{LL} D_f (1 - \eta) - (R_{ep} - \partial w / \partial p) (R_L - p R_{ep})] - [R_{pp} (R_p L - \partial w / \partial p) + R_{LL} (\partial D_f / \partial T) (U_{YY} - p U_{XY}) + R_{pp} R_{LL} (U_{YY} - 2 p U_{XY} + p^2 U_{XX})] / J > 0, \]

\[ M = -\lambda [R_{KK} + R_{LK} (\partial L / \partial K) + R_{KL} (\partial p / \partial K)] = -\lambda [R_{pp} (R_p L - \partial w / \partial p) (R_p L - \partial w / \partial p) (R_p L - \partial w / \partial p) (R_p L - \partial w / \partial p) (R_p L - \partial w / \partial p)] - R_{KK} R_{LL} (U_{XX} U_{YY} - U_{XY}^2) + (R_{LL} R_{KK} - R_{LL}^2) [(\partial D_f / \partial p - R_{pp}) (U_{XX} U_{YY} - U_{XY}^2) + \lambda U_{XX}] / J > 0, \]
\[ N = - \lambda \left[ R_K (\partial p / \partial \lambda) + R_{KL} (\partial L / \partial \lambda) \right] = - \lambda R_{pk} R_{LK} [R_{LL}/R_{LK} - R_{lp}/R_{pk} + (\partial w/\partial p)/R_{pk}] (U_{XY} - pU_{XX})/J < 0, \]

where the condition that \( \eta \geq 1 \) is imposed in the sign of \( B \). Furthermore, \( R_L - p R_{lp} = R_{L1} < 0 \) because \( R_L \) is homogeneous of degree one in prices, and the subscript \( 1 \) denotes the price of the traded good \( X \), which is relatively capital intensive (i.e., \( R_{L1} < 0 \) and \( R_{lp} > 0 \)). In addition, for stability, we need \( R_{pl} > \partial w / \partial p > 0 \).
**NOTE DI LAVORO DELLA FONDAZIONE ENI ENRICO MATTEI**

Fondazione Eni Enrico Mattei Working Paper Series

Our Note di Lavoro are available on the Internet at the following addresses:

http://www.feem.it/Feem/Pub/Publications/WPapers/default.html


http://www.repec.org

---

**NOTE DI LAVORO PUBLISHED IN 2004**

<table>
<thead>
<tr>
<th>WP Number</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEM 1.2004</td>
<td>Anil MARKANDYA, Suzette PEDROSO and Alexander GOLUB: Empirical Analysis of National Income and So2 Emissions in Selected European Countries</td>
</tr>
<tr>
<td>ETA 2.2004</td>
<td>Masahisa FUJITA and Shlomo WEBER: Strategic Immigration Policies and Welfare in Heterogeneous Countries</td>
</tr>
<tr>
<td>PRA 3.2004</td>
<td>Adolfo DI CARLUCCIO, Giovanni FERRI, Cecilia FraLE and Ottavio RICCHI: Do Privatizations Boost Household Shareholding? Evidence from Italy</td>
</tr>
<tr>
<td>ETA 4.2004</td>
<td>Victor GINSBURGH and Shlomo WEBER: Languages Disenfranchisement in the European Union</td>
</tr>
<tr>
<td>PRA 7.2004</td>
<td>Sandro BRUSCO, Giuseppe LLOPOMO and S. VISWANATHAN (lxv): Merger Mechanisms</td>
</tr>
<tr>
<td>PRA 8.2004</td>
<td>Wolfgang AUSSENNEGG, Pegaret PICHLER and Alex STOMPER (lxv): IPO Pricing with Bookbuilding, and a When-Issued Market</td>
</tr>
<tr>
<td>PRA 9.2004</td>
<td>Pegaret PICHLER and Alex STOMPER (lxv): Primary Market Design: Direct Mechanisms and Markets</td>
</tr>
<tr>
<td>PRA 11.2004</td>
<td>Bjarni BRENDSTRUP and Harry J. PAARSCH (lxv): Nonparametric Identification and Estimation of Multi-Unit, Sequential, Oral, Ascending-Price Auctions With Asymmetric Bidders</td>
</tr>
<tr>
<td>PRA 12.2004</td>
<td>Ohad KADAN (lxv): Equilibrium in the Two Player, k-Double Auction with Affiliated Private Values</td>
</tr>
<tr>
<td>PRA 13.2004</td>
<td>Marien C.W. JANSEN (lxv): Auctions as Coordination Devices</td>
</tr>
<tr>
<td>PRA 14.2004</td>
<td>Gadi FIBICH, Arieh GAVIOUS and Aner SELA (lxv): All-Pay Auctions with Weakly Risk-Averse Buyers</td>
</tr>
<tr>
<td>PRA 15.2004</td>
<td>Orly SADE, Charles SCHNITZLEIN and Jaime F. ZENDER (lxv): Competition and Cooperation in Divisible Good Auctions: An Experimental Examination</td>
</tr>
<tr>
<td>PRA 16.2004</td>
<td>Marta STRYSZOWSKA (lxv): Late and Multiple Bidding in Competing Second Price Internet Auctions</td>
</tr>
<tr>
<td>PRA 17.2004</td>
<td>Slim Ben YOUSSEF: R&amp;D in Cleaner Technology and International Trade</td>
</tr>
<tr>
<td>NRM 18.2004</td>
<td>Angela ANTOCI, Simone BORGHESI and Paolo RUSSU (lxvi): Biodiversity and Economic Growth: Stabilization Versus Preservation of the Ecological Dynamics</td>
</tr>
<tr>
<td>SIEV 19.2004</td>
<td>Anna ALBERINI, Paolo ROSATO, Alberto LONGO and Valentina ZANATTA: Information and Willingness to Pay in a Contingent Valuation Study: The Value of S. Erasmo in the Lagoon of Venice</td>
</tr>
<tr>
<td>NRM 21.2004</td>
<td>Jacqueline M. HAMILTON (lxvii): Climate and the Destination Choice of German Tourists</td>
</tr>
<tr>
<td>NRM 23.2004</td>
<td>Pius ODUNGA and Henk FOLMER (lxvii): Profiling Tourists for Balanced Utilization of Tourism-Based Resources in Kenya</td>
</tr>
<tr>
<td>NRM 24.2004</td>
<td>Jean-Jacques NOWAK, Mondher SAHLI and Pasquale M. SGRO (lxvii): Tourism, Trade and Domestic Welfare</td>
</tr>
<tr>
<td>NRM 26.2004</td>
<td>Juan Luis EUGENIO-MARTÍN, Noelia MARTÍN MORALES and Riccardo SCARPA (lxvii): Tourism and Economic Growth in Latin American Countries: A Panel Data Approach</td>
</tr>
<tr>
<td>NRM 27.2004</td>
<td>Raúl Hernández MARTÍN (lxvii): Impact of Tourism Consumption on GDP: The Role of Imports</td>
</tr>
<tr>
<td>NRM 29.2004</td>
<td>Marian WEBER (lxviii): Assessing the Effectiveness of Tradable Landuse Rights for Biodiversity Conservation: an Application to Canada’s Boreal Mixedwood Forest</td>
</tr>
<tr>
<td>NRM 30.2004</td>
<td>Trond BJORNDAL, Phoebe KOUNDOURI and Sean PASCOE (lxviii): Output Substitution in Multi-Species Trawl Fisheries: Implications for Quota Setting</td>
</tr>
<tr>
<td>CTN 33.2004</td>
<td>Wilson PEREZ: Divide and Conquer: Noisy Communication in Networks, Power, and Wealth Distribution</td>
</tr>
</tbody>
</table>
An Application to the Recreational Value of Forests

Gernot KLEPPER and Sonja PETERSON:

Andrea BIGANO and Stef PROOST:

Timo GOESCHL and Tun LIN (lxvi):

Biodiversity Conservation on Private Lands: Information Problems and

Signe ANTHON and Bo JELLEMARK THORSEN (lxvi):

Francesco RICCI:

Ingo BRÄUER and Rainer MARGGRAF:

Dinko DIMITROV, Peter BORM, Ruud HENDRICKX and Shao CHIN SUNG:

Valentina BOSETTI, Mariaester CASSINELLI and Alessandro LANZA:

E.C.M. RUIJGROK:

Netherlands

Technology-based Climate Protocol

Analysis of Extractive Reserves in the Brazilian Amazon

Optimal Afforestation Contracts with Asymmetric Information on Private Environmental Benefits

Wildlife Conservation and Management in Kenya: Towards a Co-management Approach

Using a Choice Experiment to Value Agricultural Biodiversity on Hungarian Small Farms: Agri-Environmental Policies in a Transition al Economy

The EU Emissions Trading Scheme: Allowance Prices, Trade Flows, Competitiveness Effects

Optimal Disease Eradication

Simple Priorities and Core Stability in Hedonic Games

Channels of Transmission of Environmental Policy to Economic Growth: A Survey of the Theory

Willingness to Pay for Mortality Risk Reductions: Does Latency Matter?

Valuation of Ecosystem Services Provided by Biodiversity

Conservation: An Integrated Hydrological and Economic Model to Value the Enhanced Nitrogen Retention in Renaturated Streams

Biodiversity Conservation on Private Lands: Information Problems and Regulatory Choices

Bioprospection: From the Economics of Contracts to Reflexive Governance

The Amenity Value of Climate to German Households

Notes on the Determinants of Innovation: A Multi-Perspective Analysis

The Socio-Economic Value of Natural Riverbanks in the Netherlands

The Socio-Economic Value of Natural Riverbanks in the Netherlands

Reducing Acidification: The Benefits of Increased Nature Quality. Investigating the Possibilities of the Contingent Valuation Method

Uncertainty Aversion, Robust Control and Asset Holdings

Participation in and Compliance with Public Voluntary Environmental Programs: An Evolutionary Approach

Optimal Disease Eradication

Does the Degree of Competition Matter?

Policy: Does the Degree of Competition Matter?

Environmental Externalities of Geological Carbon Sequestration

Appraising Diversity with an Ordinal Notion of Similarity: An Axiomatic Approach

The Northern Atlantic Bluefin Tuna Fisheries: Management and Policy Implications

On Coalition Formation with Heterogeneous Agents

Conditional Correlations in the Returns on Oil Companies Stock Prices and Their Determinants

Modelling Dynamic Conditional Correlations in WTI Oil Forward and Futures Returns

The Copula Approach to Sample Selection Modelling: An Application to the Recreational Value of Forests
Auctions

Price Sealed-Bid Auctions

the Incidence of Commissions in Auction Markets

Maximization and the Multiple-Good Monopoly

and Evidence from Timber Auctions

Roberto BURGUET

Externalities

in Stabilization Policies?

Bookbuilding is Dominating Auctions

Real Option Analysis

Environmental Taxation Game

Č

Influence of World Energy Prices

for Public Goods: Finite Versus Continuous Mixing in Logit Models

Latent-Class Approach Based on Intensity of Participation

Savings

Analysis of Climate Change Impacts on Tourism

from Poland and the Czech Republic

Economy

for Security of Energy Supply

Alejandro M. MANELLI and Daniel R. VINCENT

Philip A. HAILE, Han HONG and Matthew SHUM

Patrick BAJARI, Stephanie HOUGHTON and Steven TADELIS

Ramona CURRIER, Santiago J. RUBIO, John ASKER and Estelle CANTILLON

Ali HORTACSU and Samita SAREEN

ZhongXiang ZHANG

Reyer GERLAGH and Marja W. HOFKES: Time Profile of Climate Change Stabilization Policy

Chiara D’ALPAOS and Michele MORETTO: The Value of Flexibility in the Italian Water Service Sector: A

Chiara D’ALPAOS and Michele MORETTO: The Value of Flexibility in the Italian Water Service Sector: A

Chiara D’ALPAOS and Michele MORETTO: The Value of Flexibility in the Italian Water Service Sector: A

Chiara D’ALPAOS and Michele MORETTO: The Value of Flexibility in the Italian Water Service Sector: A

Chiara D’ALPAOS and Michele MORETTO: The Value of Flexibility in the Italian Water Service Sector: A

Chiara D’ALPAOS and Michele MORETTO: The Value of Flexibility in the Italian Water Service Sector: A

Chiara D’ALPAOS and Michele MORETTO: The Value of Flexibility in the Italian Water Service Sector: A

Chiara D’ALPAOS and Michele MORETTO: The Value of Flexibility in the Italian Water Service Sector: A

Chiara D’ALPAOS and Michele MORETTO: The Value of Flexibility in the Italian Water Service Sector: A

Chiara D’ALPAOS and Michele MORETTO: The Value of Flexibility in the Italian Water Service Sector: A
NOTE DI LAVORO PUBLISHED IN 2005

CCMP 2.2005 Qiang WU and Paolo Augusto NUNES: Application of Technological Control Measures on Vehicle Pollution: A Cost-Benefit Analysis in China

CCMP 3.2005 Andrea BIGANO, Jacqueline M. HAMILTON, Maren LAU, Richard S.J. TOL and Yuan ZHOU: A Global Database of Domestic and International Tourist Numbers at National and Subnational Level

CCMP 4.2005 Andrea BIGANO, Jacqueline M. HAMILTON and Richard S.J. TOL: The Impact of Climate on Holiday Destination Choice

ETA 2.2005 Hubert KEMPF: Is Inequality Harmful for the Environment in a Growing Economy?


CCMP 9.2005 Angelo ANTOCI: Environmental Resources Depletion and Interplay Between Negative and Positive Externalities in a Growth Model

CTN 10.2005 Frédéric DEROIN: Cost-Reducing Alliances and Local Spillovers

NRM 11.2005 Francesco SINDICO: The GMO Dispute before the WTO: Legal Implications for the Trade and Environment Debate


PRCG 14.2005 Clara GRAZIANO and Annalisa LUPORINI: Ownership Concentration, Monitoring and Optimal Board Structure

CSRM 15.2005 Parashar KULKARNI: Use of Ecolabels in Promoting Exports from Developing Countries to Developed Countries: Lessons from the Indian LeatherFootwear Industry

KTHC 16.2005 Adriana DI LIBERTO, Roberto MURA and Francesco PIGLIARU: How to Measure the Unobservable: A Panel Technique for the Analysis of TFP Convergence

KTHC 17.2005 Alireza NAGHAVI: Asymmetric Labor Markets, Southern Wages, and the Location of Firms

KTHC 18.2005 Alireza NAGHAVI: Strategic Intellectual Property Rights Policy and North-South Technology Transfer

KTHC 19.2005 Mombert HOPPE: Technology Transfer Through Trade

PRCG 20.2005 Roberto ROSON: Platform Competition with Endogenous Multihoming

CCMP 21.2005 Barbara BUCHNER and Carlo CARRARO: Regional and Sub-Global Climate Blocs. A Game Theoretic Perspective on Bottom-up Climate Regimes


CTN 23.2005 Michael FINUS, Pierre v. MOUCHE and Bianca RUNDSHAGEN: Uniqueness of Coalitional Equilibria


CTN 25.2005 Somdeb LAHIRI: The Core of Directed Network Problems with Quotas


NRM 27.2005 Massimiliano MAZZANTI and Anna MONTINI: The Determinants of Residential Water Demand Empirical Evidence for a Panel of Italian Municipalities

CCMP 28.2005 Laurent GILOTTE and Michel de LARA: Precautionary Effect and Variations of the Value of Information

NRM 29.2005 Paul SARFO-MENSAH: Exportation of Timber in Ghana: The Menace of Illegal Logging Operations

CCMP 30.2005 Andrea BIGANO, Alessandra GORIA, Jacqueline HAMILTON and Richard S.J. TOL: The Effect of Climate Change and Extreme Weather Events on Tourism

NRM 31.2005 Maria Angeles GARCIA-VALINAS: Decentralization and Environment: An Application to Water Policies

NRM 32.2005 Chiara D’ALPAOS, Cesare DOSI and Michele MORETTO: Concession Length and Investment Timing Flexibility

CCMP 33.2005 Joseph HUBER: Key Environmental Innovations

CTN 34.2005 Antonio CALVÓ-ARMENGOL and Rahmi İLKILIÇ (lxxii): Pairwise-Stability and Nash Equilibria in Network Formation

CTN 35.2005 Francesco FERI (lxxii): Network Formation with Endogenous Decay

CTN 36.2005 Frank H. PAGE, Jr. and Myrna H. WOODERS (lxxii): Strategic Basins of Attraction, the Farsighted Core, and Network Formation Games...
<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>38.2005</td>
<td>Social Games: Matching and the Play of Finitely Repeated Games</td>
<td>Matthew O. JACKSON and Alison WATTTS (lxxii):</td>
</tr>
<tr>
<td>39.2005</td>
<td>The Egalitarian Sharing in Provision of Public Projects</td>
<td>Anna BOGOMOLNAIA, Michel LE BRETON, Alexi SAVVATEEV and Shlomo WEBER (lxxii):</td>
</tr>
<tr>
<td>40.2005</td>
<td>Stochastic Stability in Network with Decay</td>
<td>Francesco FERI (lxxii):</td>
</tr>
<tr>
<td>42.2005</td>
<td>Measuring the Economic Value of Two Habitat Defragmentation Policy Scenarios for the Veluwe, The Netherlands</td>
<td>KTHC (lxxii):</td>
</tr>
<tr>
<td>43.2005</td>
<td>Abnormal Returns in Privatization Public Offerings: The Case of Portuguese Firms</td>
<td>Carla VEIRA and Ana Paula SERBA:</td>
</tr>
<tr>
<td>44.2005</td>
<td>Combining Actual and Contingent Behavior to Estimate the Value of Sports Fishing in the Lagoon of Venice</td>
<td>Anna ALBERINI, Valentina ZANATTA and Paolo ROSATO:</td>
</tr>
<tr>
<td>48.2005</td>
<td>Participation in International Environmental Agreements: The Role of Timing and Regulation</td>
<td>Micheal FINUS and Bianca RUNDSHAGEN (lxxii):</td>
</tr>
<tr>
<td>49.2005</td>
<td>Are EU Environmental Policies Too Demanding for New Members States?</td>
<td>Lorenzo PELLEGRINI and Reyer GERLAGH (lxxii):</td>
</tr>
<tr>
<td>50.2005</td>
<td>Modeling Factor Demands with SEM and VAR: An Empirical Comparison</td>
<td>Matteo MANERA (lxxii):</td>
</tr>
<tr>
<td>45.2005</td>
<td>A Characterization of Stochastically Stable Networks</td>
<td>Olivier TERCIEUX and Vincent VANNETELBOSCH (lxxii):</td>
</tr>
<tr>
<td>51.2005</td>
<td>Among Unionized Firms</td>
<td>Anna MAULEON, José SEMPERE-MONERRIS and Vincent J. VANNETELBOSCH (lxxii):</td>
</tr>
<tr>
<td>52.2005</td>
<td>Optimal Transfers and Participation Decisions in International Environmental Agreements</td>
<td>Carlo CARRARO, Johan EYCKMANS and Michael FINUS (lxxii):</td>
</tr>
<tr>
<td>54.2005</td>
<td>Investment and Time to Plan: A Comparison of Structures vs. Equipment in a Panel of Italian Firms</td>
<td>Alessandra del BOCA, Marzio GALEOTTI, Charles P. HIMMELBERG and Paolo ROTA (lxxii):</td>
</tr>
<tr>
<td>55.2005</td>
<td>The Climate Strategy of the EU</td>
<td>Gernot KLEPPER and Sonja PETERSON:</td>
</tr>
<tr>
<td>57.2005</td>
<td>Trust and Fiscal Performance: A Panel Analysis with Swiss Data</td>
<td>Alain-Désiré NIMUBONA and Bernard SINCLAIR-DESGAGNÉ:</td>
</tr>
<tr>
<td>60.2005</td>
<td>Impure Public Goods and Technological Interdependencies</td>
<td>Christoph A. SCHALTEGGER and Benno TORGLER (lxxii):</td>
</tr>
<tr>
<td>61.2005</td>
<td>A Data Envelopment Analysis Approach to the Assessment of Natural Parks’ Economic Efficiency and Sustainability. The Case of Italian National Parks</td>
<td>Arianne T. de BLAELJ, Paulo A.L.D. NUNES and Jeroen C.J.M. van den BERGH:</td>
</tr>
<tr>
<td>62.2005</td>
<td>Trust and Fiscal Performance: A Panel Analysis with Swiss Data</td>
<td>Irene FALSECCHI: A Role for Instructions (lxxii):</td>
</tr>
<tr>
<td>63.2005</td>
<td>A Data Envelopment Analysis Approach to the Assessment of Natural Parks’ Economic Efficiency and Sustainability. The Case of Italian National Parks</td>
<td>Valentina BOSETTI and Gianni LOCATELLI:</td>
</tr>
<tr>
<td>64.2005</td>
<td>Modeling ‘No-choice’ Responses in Attribute Based Valuation Surveys</td>
<td>Aliénor M. DAMIEN and Bernard SINCLAIR-DESGAGNÉ: (lxxii):</td>
</tr>
<tr>
<td>65.2005</td>
<td>Applications of Negotiation Theory to Water Issues</td>
<td>Carlo CARRARO, Carmen MARCHIORI and Alessandra SGOBBI (lxxii):</td>
</tr>
<tr>
<td>66.2005</td>
<td>Advances in Negotiation Theory: Bargaining, Coalitions and Fairness</td>
<td>Carlo CARRARO, Carmen MARCHIORI and Alessandra SGOBBI (lxxii):</td>
</tr>
<tr>
<td>68.2005</td>
<td>On the Determinants of Social Capital in Greece Compared to Countries of the European Union</td>
<td>Asimina CHRISTOFOROU (lxxiv):</td>
</tr>
<tr>
<td>69.2005</td>
<td>Varieties of Trust</td>
<td>Eric M. USLANER (lxxiv):</td>
</tr>
<tr>
<td>71.2005</td>
<td>Citizenship Laws and International Migration in Historical Perspective</td>
<td>Graziella BERTOCCHI and Chiara STROZZI (lxxiv):</td>
</tr>
<tr>
<td>72.2005</td>
<td>Accommodating Differences</td>
<td>Elisbeth van HYLCKAMA VLIJEG (lxxv):</td>
</tr>
<tr>
<td>73.2005</td>
<td>Governance of Diversity Between Social Dynamics and Conflicts in Multicultural Cities, A Selected Survey on Historical Bibliography</td>
<td>Renato SANSAS and Ercole SORI (lxxv):</td>
</tr>
</tbody>
</table>
Margherita GRASSO and Matteo MANERA: Asymmetric Error Correction Models for the Oil-Gasoline Price Relationship

Humberto CHERUBINI and Matteo MANERA: Hunting the Living Dead A “Peso Problem” in Corporate Liabilities Data

Hans-Peter WEIKARD: Cartel Stability under an Optimal Sharing Rule

Joëlle NOAILLY, Jeroen C.J.M. van den BERGH and Cees A. WITTHAEGEN (lxxvi): Local and Global Interactions in an Evolutionary Resource Game

Joëlle NOAILLY, Cees A. WITTHAEGEN and Jeroen C.J.M. van den BERGH (lxxvi): Spatial Evolution of Social Norms in a Common-Pool Resource Game

Maximiliano MAZZANTI and Roberto ZOBOLI: Economic Instruments and Induced Innovation: The Case of End-of-Life Vehicles European Policies

Anna LASUT: Creative Thinking and Modelling for the Decision Support in Water Management

Valentina BOSETTI and Barbara BUCHNER: Using Data Envelopment Analysis to Assess the Relative Efficiency of Different Climate Policy Portfolios

Ignazio MUSU: Intellectual Property Rights and Biotechnology: How to Improve the Present Patent System

Giulio CAIENELLI, Susanna MANCINELLI and Massimiliano MAZZANTI: Social Capital, R&D and Industrial Districts

Rosella LEVAGGI, Michele MORETTO and Vincenzo REBBA: Quality and Investment Decisions in Hospital Care when Physicians are Devoted Workers

Valentina BOSETTI and Laurent GILOTTE: Carbon Capture and Sequestration: How Much Does this Uncertain Option Affect Near-Term Policy Choices?

Ani MARKANDYA and S. PEDROSO: How Substitutable is Natural Capital?

Valentina BOSETTI, Nicoleta FERRO: Value Through Diversity: Microfinance and Islamic Finance and Global Banking

A. MARKANDYA and S. PEDROSO: How Substitutable is Natural Capital?

Francesco BOSELLO and Jian ZHANG: Assessing Climate Change Impacts: Agriculture

Alessandro COLONNI and Matteo MANERA: Oil Prices, Inflation and Interest Rates in a Structural Cointegrated VAR Model for the G-7 Countries


Rob DELINK, Michael FINUS and Niels OLJEMAN: Coalition Formation under Uncertainty: The Stability of Likelihood of an International Climate Agreement

Valeria COSTANTINI, Riccardo CRESCENZI, Fabrizio De FILIPPIS, and Luca SALVATI: Bargaining in the Agricultural Negotiations of the Doha Round: Similarity of Interests or Strategic Choices? An Empirical Assessment

Gigliola FREY and Matteo MANERA: Econometric Models of Asymmetric Price Transmission

Alessandro COLONNI and Matteo MANERA: Oil Prices, Inflation and Interest Rates in a Structural Cointegrated VAR Model for the G-7 Countries

Chiara M. TRAVISI and Roberto CAMAGNI: Sustainability of Urban Sprawl: Environmental-Economic Indicators for the Analysis of Mobility Impact in Italy

Joëlle NOAILLY, S. LUOBOBI and Joseph Y.T. MUGISHA: Was It Something I Ate? Implementation of the FDA Seafood HACCP Program

Anna ALBERINI, Erik LICHTENBERG, Dominic MANCINI, and Gregmar I. GALINATO: What are the Effects of Contamination Risks on Commercial and Industrial Properties? Evidence from Baltimore, Maryland

Anna ALBERINI and Alberto LONGO: The Value of Cultural Heritage Sites in Armenia: Evidence from a Travel Cost Method Study

Mikel GONZALEZ and Rob DELINK: Impact of Climate Policy on the Basque Economy

Gilles LAFFORGUE and Walid OUESLATI: Optimal Soil Management and Environmental Policy
Valuing Ecosystem Services with Fishery Rents: A Lumped-Parameter Approach to Hypoxia in the Neuse River Estuary

Protecting Marine Biodiversity: A Comparison of Individual Habitat Quotas (IHQs) and Marine Protected Areas

The Evolution of Enterprise Reform in Africa: From State-owned Enterprises to Private Participation in Infrastructure — and Back?

Italy’s Privatization Process and Its Implications for China

Protecting Marine Biodiversity: A Comparison of Individual Habitat Quotas (IHQs) and Marine Protected Areas

A Solution to Matching with Preferences over Colleagues

Dissipation of Knowledge and the Boundaries of the Multinational Enterprise

Firm’s Intangible Assets and Multinational Activity: Joint-Venture Versus FDI

An Analysis of Technological Portfolios for CO2 stabilizations and Effects of Technological Changes

Induced Technological Change in a Limited Foresight Optimization Model

The Value of ITC under Climate Stabilization

Privatization in Africa: What has happened? What is to be done?

Contest with Attack and Defence: Does Negative Campaigning Increase or Decrease Voters’ Turnout?

Political Cycles: The Opposition Advantage

Dynamic Controllability with Overlapping targets: A Generalization of the Tinbergen-Nash Theory of Economic Policy

Institutional Explanations of Economic Development: the Role of Precious Metals

Controllability in Policy Games

Restructuring Italian Utility Markets: Household Distributinal Effects

The Impact of Speed Limits on Recreational Boating in the Lagoon of Venice

Tourism, Jobs, Capital Accumulation and the Economy: A Dynamic Analysis
(lxv) This paper was presented at the EuroConference on “Auctions and Market Design: Theory, Evidence and Applications” organised by Fondazione Eni Enrico Mattei and sponsored by the EU, Milan, September 25-27, 2003

(lxvi) This paper has been presented at the 4th BioEcon Workshop on “Economic Analysis of Policies for Biodiversity Conservation” organised on behalf of the BIOECON Network by Fondazione Eni Enrico Mattei, Venice International University (VIU) and University College London (UCL), Venice, August 28-29, 2003

(lxvii) This paper has been presented at the international conference on “Tourism and Sustainable Economic Development – Macro and Micro Economic Issues” jointly organised by CRENoS (Università di Cagliari e Sassari, Italy) and Fondazione Eni Enrico Mattei, and supported by the World Bank, Sardinia, September 19-20, 2003

(lxviii) This paper was presented at the ENGIME Workshop on “Governance and Policies in Multicultural Cities”, Rome, June 5-6, 2003

(lxix) This paper was presented at the Fourth EEP Plenary Workshop and EEP Conference “The Future of Climate Policy”, Cagliari, Italy, 27-28 March 2003

(lxx) This paper was presented at the 9th Coalition Theory Workshop on “Collective Decisions and Institutional Design” organised by the Universitat Autònoma de Barcelona and held in Barcelona, Spain, January 30-31, 2004

(lxxi) This paper was presented at the 10th Coalition Theory Network Workshop held in Paris, France on 28-29 January 2005 and organised by EUREQua.

(lxxii) This paper was presented at the 2nd Workshop on "Inclusive Wealth and Accounting Prices" held in Trieste, Italy on 13-15 April 2005 and organised by the Ecological and Environmental Economics - EEE Programme, a joint three-year programme of ICTP - The Abdus Salam International Centre for Theoretical Physics, FEEM - Fondazione Eni Enrico Mattei, and The Beijer International Institute of Ecological Economics

(lxxiii) This paper was presented at the ENGIME Workshop on “Trust and social capital in multicultural cities” Athens, January 19-20, 2004

(lxxiv) This paper was presented at the 3rd Workshop on Spatial-Dynamic Models of Economics and Ecosystems held in Trieste on 11-13 April 2005 and organised by the Ecological and Environmental Economics - EEE Programme, a joint three-year programme of ICTP - The Abdus Salam International Centre for Theoretical Physics, FEEM - Fondazione Eni Enrico Mattei, and The Beijer International Institute of Ecological Economics

(lxxv) This paper was presented at the Workshop on Infectious Diseases: Ecological and Economic Approaches held in Trieste on 13-15 April 2005 and organised by the Ecological and Environmental Economics - EEE Programme, a joint three-year programme of ICTP - The Abdus Salam International Centre for Theoretical Physics, FEEM - Fondazione Eni Enrico Mattei, and The Beijer International Institute of Ecological Economics.

(lxxvi) This paper was presented at the Second International Conference on "Tourism and Sustainable Economic Development - Macro and Micro Economic Issues” jointly organised by CRENoS (Università di Cagliari and Sassari, Italy) and Fondazione Eni Enrico Mattei, Italy, and supported by the World Bank, Chia, Italy, 16-17 September 2005.
### 2004 SERIES

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Editor</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCMP</td>
<td>Climate Change Modelling and Policy</td>
<td>Marzio Galeotti</td>
</tr>
<tr>
<td>GG</td>
<td>Global Governance</td>
<td>Carlo Carraro</td>
</tr>
<tr>
<td>SIEV</td>
<td>Sustainability Indicators and Environmental Valuation</td>
<td>Anna Alberini</td>
</tr>
<tr>
<td>NRM</td>
<td>Natural Resources Management</td>
<td>Carlo Giupponi</td>
</tr>
<tr>
<td>KTHC</td>
<td>Knowledge, Technology, Human Capital</td>
<td>Gianmarco Ottaviano</td>
</tr>
<tr>
<td>IEM</td>
<td>International Energy Markets</td>
<td>Anil Markandya</td>
</tr>
<tr>
<td>CSRM</td>
<td>Corporate Social Responsibility and Sustainable Management</td>
<td>Sabina Ratti</td>
</tr>
<tr>
<td>PRA</td>
<td>Privatisation, Regulation, Antitrust</td>
<td>Bernardo Bortolotti</td>
</tr>
<tr>
<td>ETA</td>
<td>Economic Theory and Applications</td>
<td>Carlo Carraro</td>
</tr>
<tr>
<td>CTN</td>
<td>Coalition Theory Network</td>
<td></td>
</tr>
</tbody>
</table>

### 2005 SERIES

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Editor</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCMP</td>
<td>Climate Change Modelling and Policy</td>
<td>Marzio Galeotti</td>
</tr>
<tr>
<td>SIEV</td>
<td>Sustainability Indicators and Environmental Valuation</td>
<td>Anna Alberini</td>
</tr>
<tr>
<td>NRM</td>
<td>Natural Resources Management</td>
<td>Carlo Giupponi</td>
</tr>
<tr>
<td>KTHC</td>
<td>Knowledge, Technology, Human Capital</td>
<td>Gianmarco Ottaviano</td>
</tr>
<tr>
<td>IEM</td>
<td>International Energy Markets</td>
<td>Anil Markandya</td>
</tr>
<tr>
<td>CSRM</td>
<td>Corporate Social Responsibility and Sustainable Management</td>
<td>Sabina Ratti</td>
</tr>
<tr>
<td>PRA</td>
<td>Privatisation, Regulation, Antitrust</td>
<td>Bernardo Bortolotti</td>
</tr>
<tr>
<td>ETA</td>
<td>Economic Theory and Applications</td>
<td>Carlo Carraro</td>
</tr>
<tr>
<td>CTN</td>
<td>Coalition Theory Network</td>
<td></td>
</tr>
</tbody>
</table>