Sustainable Development and the Bulgarian National Strategy for Regional Development 2005-2015: an application of a three dimensional theoretical model

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1. Why sustainable development?

- The results of excessive production and consumption:
- Depletion of resources;
- Spreading of dangerous pollutants;
- Destruction of ecosystems;
- Disruption of the planet's climatic balance

1. Why sustainable development?

We have less than 250 years to save the planet!

Is it possible to make policy changes that could lead to a sustainable world and what policies would be effective?

1. Why sustainable development?

To achieve sustainability, environmental protection and social welfare, we must opt for a less consumptive economy

But…

Is it possible to have both increased consumption and clean world?

Which is the key for governments to achieve this controversial symbiosis?

2. The three dimensions of sustainability

- We often refer to the three dimensions of sustainability as "systems" – the economic system, the environmental system and the social system – and each system has its own logic, so it seems almost impossible to analyze all of them at once

The three main objectives of our analysis:

- To make a differentiation between "Sustainability" and "Sustainable Development"
- To propose the three-dimensional model of sustainable development
- To prove that sustainable development can be achieved through the combined action of the three elements under the conditions of subsidizing public and private production

2. The three-dimensional model

- The function $\varphi(x, y, z)$ is an objective function, which we wish to maximize under a given linear constraint:

$$\max_{x \geq 0, y \geq 0, z \geq 0} \varphi(x, y, z)$$

such that $\left\langle a^1, x \right\rangle + \left\langle a^2, y \right\rangle + \left\langle a^3, z \right\rangle \leq b$
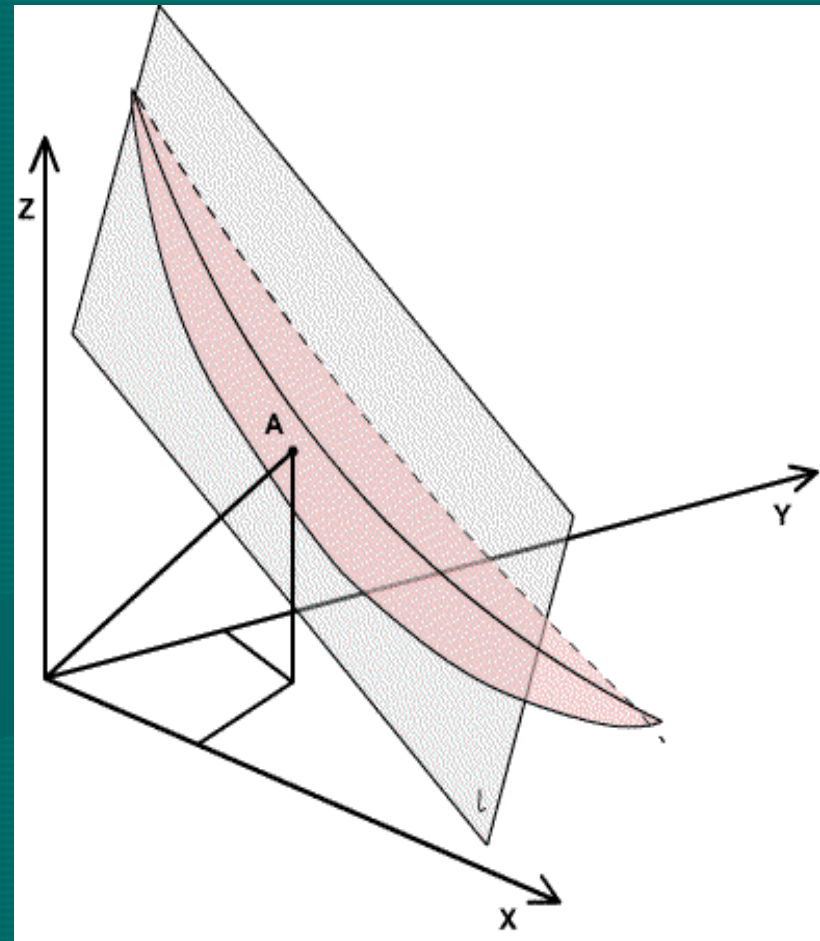
2. The three-dimensional model

$$\varphi(x, y, z) = k$$
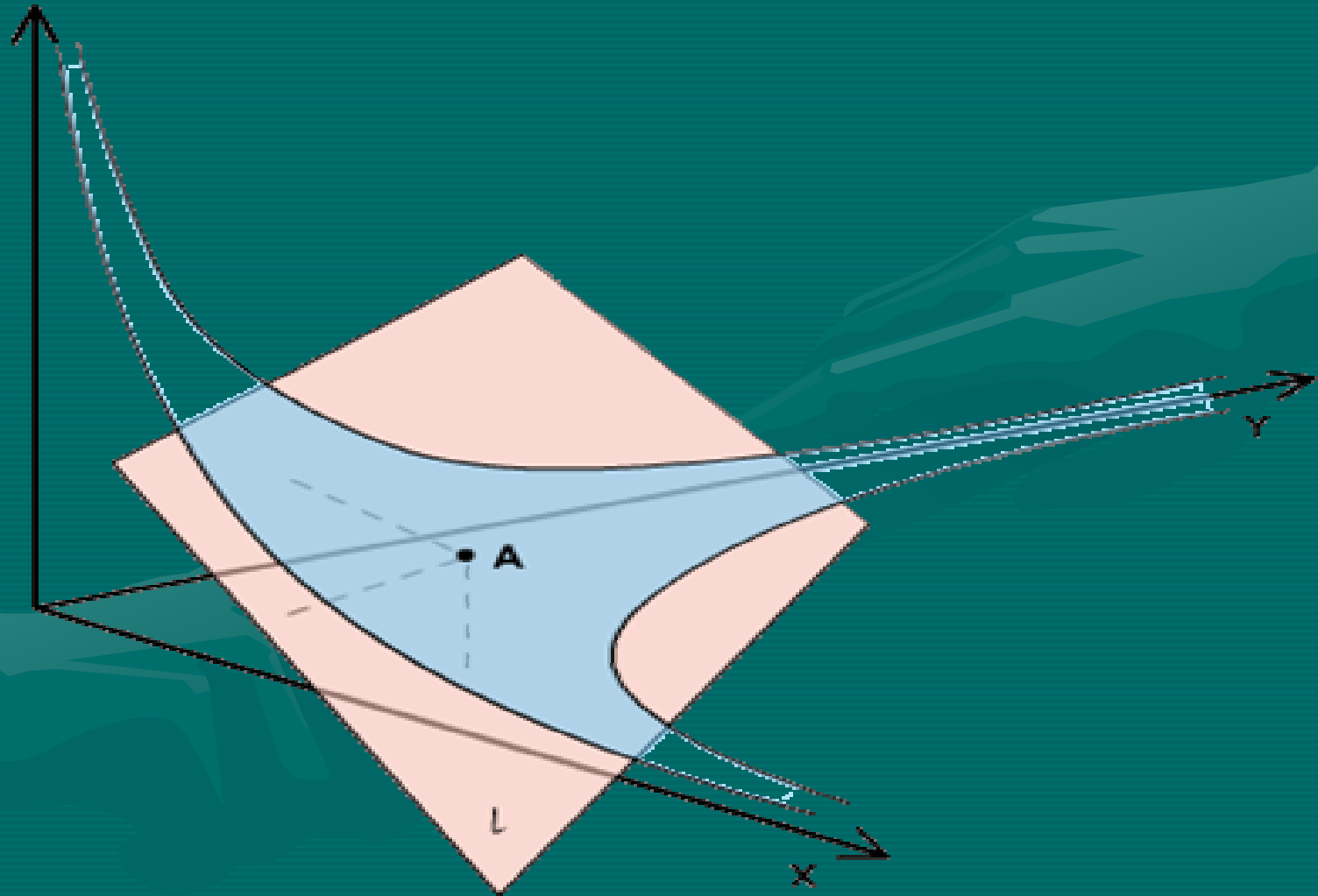
$$x \in R^1, y \in R^1, z \in R^1$$

$$l : a^1 x + a^2 y + a^3 z = b$$

$$m^* = (x^*, y^*, z^*)$$

$$A\ (x^*, y^*, z^*)$$

2. The three-dimensional model

2. The three-dimensional model

$$v(a,b) = \max_{x \geq 0, y \geq 0, z \geq 0} \varphi(x, y, z)$$

such that $\langle a^1, x \rangle + \langle a^2, y \rangle + \langle a^3, z \rangle \leq b$

The solution to this equation is the vector *m*(a, b)* which defines the point of **maximum**.

$$g(a,k) = \min_{x \geq 0, y \geq 0, z \geq 0} \langle a^1, x \rangle + \langle a^2, y \rangle + \langle a^3, z \rangle$$

such that $\varphi(x, y, z) \geq k$

The solution to this equation is *h*(a, k)*, which defines the point of **minimum**.

2. The three-dimensional model

- The Slutsky equation:

$$\frac{\partial m_i(a^*,b^*)}{\partial a_j} = \frac{\partial h_i(a^*,k^*)}{\partial a_j} - m_j(a^*,b^*)\frac{\partial m_i(a^*,b^*)}{\partial b}$$

- following the general equilibrium theory, and depending on the changes in the values of the constraint, we can classify the variables as **normal, ordinary, luxury, necessary, inferior or Giffen variables, and also as substitutes or complements**

3. Sustainability and sustainable regional development

- Analyze sustainable regional development by introducing the time factor t, where $t \in [1, +\infty)$

$$v^t(p^t, M^t) = \max_{E,B,S^t \geq 0} u(E^t, B^t, S^t)$$

such that $< p_E^t, E^t > + < p_B^t, B^t > + < p_S^t, S^t > \leq M^t$

- If $t \in \{1,2\}$, then the solutions to the problem for $t_1 = 1$ and $t_2 = 2$ will be accordingly $x_1^*(p_E^1, p_B^1, p_S^1, M^1)$ and $x_2^*(p_E^2, p_B^2, p_S^2, M^2)$.

3. Sustainability and sustainable regional development

- The dual problem:

$$e^t(p^t, \overline{u}) = \min_{E,B,S^t \geq 0} \left\langle (p_E^t, p_B^t, p_S^t), (E^t, B^t, S^t) \right\rangle$$

such that $\quad u^t(E^t, B^t, S^t) \geq \overline{u}$

- The solution to the minimization problem for period $t_1 = 1$ is the vector $h_1^*(p^1, u^1)$, and for period $t_2 = 2$ is the vector $h_2^*(p^2, u^2)$ and we also have $e_2 = h_2^* - h_1^* \geq 0$

Sustainability

- *Sustainability:* sustainability is present when the solution for a maximum of the utility function and minimum of the expenditure for period t is higher in value than the solution to the same model for period $t-1$ where $t \in [1,+\infty)$ or:

$$x_t^*(p^t, M^t) \equiv h_t^*(p^t, u^t) \geq x_{t-1}^*(p^{t-1}, M^{t-1}) \equiv h_{t-1}^*(p^{t-1}, u^{t-1})$$

Sustainable Regional Development

- *Sustainable Regional Development:* development which is analyzed in a three-dimensional optimization model in which the quantities of environmental goods, private goods and social welfare goods increase over time along the optimality path, i.e. they are either normal, ordinary or luxury goods. We have a process of sustainable development from moment t_0 when in each moment t that follows the goods remain of the type they were in the initial moment.

4. The policy of financing sustainable regional development as a three dimensional model

The sustainability principle is laid down in the modern regional development policy of the EU as a three-dimensional model by covering the three main dimensions, i.e. environmental protection, economic growth through encouragement of business activities, and increased quality of public services which improves the level of social welfare.

4. The policy of financing sustainable regional development as a three dimensional model

- maximizing the utility from the subsidies for regional development:

$$v^t(\theta^t, F^t) = \max_{E^t, B^t, S^t \geq 0} W(u_1(E^t, B^t, S^t), .. u_n(E^t, B^t, S^t))$$

such that $\quad \theta_1^t E^t + \theta_2^t B^t + \theta_3^t S^t \leq F^t$

4. The policy of financing sustainable regional development as a three dimensional model

- The dual (inverse) problem of cost minimization:

$$e^t(\theta^t, W^t) = \min_{E^t \geq 0, B^t \geq 0, S^t \geq 0} \theta_1^t E^t + \theta_2^t B^t + \theta_3^t S^t$$

$$\textit{such that } W(u_1(E^t, B^t, S^t), ..., u_n(E^t, B^t, S^t)) \geq W^t$$

4. The policy of financing sustainable regional development as a three dimensional model

- **successful sustainable regional development policy** is a policy in which the solution for a maximum of the social welfare function and minimum of the expenditure for subsidized production for period t is greater in value than the solution to the optimization model for period $t-1$, or:

$$x_t^*(\theta^t, F^t) \equiv h_t^*(\theta^t, W^t) \geq x_{t-1}^*(\theta^{t-1}, F^{t-1}) \equiv h_{t-1}^*(\theta^{t-1}, W^{t-1})$$

5. Sustainable regional development and its incorporation in the Bulgarian National Strategy for Regional Development 2005-2015

- Regional development policy – laid down in the Constitution of 1990;

- The crisis during the period 1992-1998;

- Major goal – to overcome the differences within the regions and tackle the problem "centre-periphery" , i.e.:

- To set up a system of priorities and goals in order to establish a policy for a balanced regional development;

- Transnational cooperation and development of infrastructure through the physical opening of the national territory to neighboring countries.

5. Sustainable regional development and its incorporation in the Bulgarian National Strategy for Regional Development 2005-2015

<u>Goals</u>:

1. Increase regional competitiveness and diminish the differences between the regions – development of business networks and regional clusters and modernization f regional infrastructure;

2. Achievement of social development and cohesion through improvement in the quality of life in the strategy target regions;

3. Development of European and regional cooperation and partnership

The protection of the environment is a horizontal priority

5. Sustainable regional development and its incorporation in the Bulgarian National Strategy for Regional Development 2005-2015

- Regional Development Operational Programme – launched in December 1007;

- Managed by the Ministry for Regional Development

- 759 project have been submitted for the period December 2007 – February 2009;

- Analyzed data covers a period of two years 2008 and 2009

- With the increase in the absorption levels of EU grants for regional development there is a substantial increase in the sustainability levels;

- The analysis shows that the amount of the financial aid is either increasing or remains the same

- Main beneficiaries – municipalities and regional structures of respective ministries but final beneficiaries are the residents of a given region

5. Sustainable regional development and its incorporation in the Bulgarian National Strategy for Regional Development 2005-2015

- Regional Development in the Balkan region:

- development of cross-border economic, social, environmental activities through joint strategy for sustainable territorial development;

- Cohesion Policy – defines cross-border cooperation on the Balkans and ultimate objective is to strengthen transnational cooperation through the promotion of integrated territorial development

- Strong connection with the aspiring countries – FYRM, Serbia, and Turkey through IPA as well as with Greece and Romania through the Structural Funds

- Main instrument – "cross-border areas"

6. Conclusions:

1. To examine the relation between a theoretical three-dimensional model and the results of the EU policy for sustainable regional development in Bulgaria and the region;

2. To prove how a mathematical optimization model can be used in a practical application, namely the planning of political decisions by taking into account the precise measurement of their intended impact;

3. The Bulgarian Regional Development Strategy for the period 2005-2015 provides substantial financial resource for achieving the targeted sustainability levels

4. Regional development is not limited to the increase in production and social welfare within the country but also covers the neighboring Balkan countries

Thank you for your attention!