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**INTERACTION BETWEEN
LEGAL AND ILLEGAL
SECTOR: THE
EMERGENCE OF THE
GREY ECONOMY**

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The presence and growth of a sector producing illegal goods has two main effects on the rate of growth and efficiency of the economy

The production of illegal goods involves a distortion in the allocation of legal resources

The consumption of illegal goods (such as drugs and weapons) generally produce negative externalities

Profits coming from illicit activities can be:

1. Invested in order to increase the growth rate of the illicit sector
 2. Utilised to finance the consumption of:
 - 2a. Illegal goods
 - 2b. Legal goods
 3. Invested in legal activities by purchasing :
 - 3a. Legal assets without taking the control of productive process
 - 3b. Legal assets taking the control of productive process
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Net investment in illegal production and the consumption of illicit goods involve a worsening of the distortions, while the consumption of legal goods and investments in the legal sector involve a mitigation of the distortions

However, the investments in the legal sector involve the emergence of a grey sector, which is formally legal but is financed by illegal profits

Even though the emergence of the grey economy tends to mitigate the distortional effects that the illegal sector has on the legal economy, we need to take into account also the (negative) institutional effects, which can overcome the positive effects coming from the redistribution of resources from the illegal to the legal sector.

In this work, we present a model able to show how the negative institutional effects of the emergence of a grey economy modifies the dynamic of the legal system in the long run

Particularly, we focus on the scenario in which criminals become entrepreneurs. In this context, the negative institutional effects of the presence of the grey sector are connected with the adverse selection process on entrepreneurship and the reduction in competition that are generally linked to the carrying out of grey activities

In order to model this hypothesis, we suppose different evolutionary paths of the technology in the legal, illegal and grey sector. This way we are able to implement the institutional effects and to show how they modify the dynamic of the economic system

1. Formalization of the model

1. Simulations

1. Conclusions

Formalization of the model 1/3

We utilise a standard neo-classical growth model with a central planner who allocate consumption and capital goods in time by maximizing a Cobb-Douglas utility function defined along different amounts of legal and illegal goods

$$\max_{[\mathbf{C}, \mathbf{K}]} \int_0^{\infty} e^{-\rho t} c_L^{\gamma} c_I^{1-\gamma} dt \quad \text{where} \quad \begin{array}{l} 0 < \gamma < 1 \\ c_L = c_L^L + c_L^G \end{array}$$

Legal and illegal goods are produced according to the following production functions:

$$\begin{array}{l} y_L = A_L k_L^{\alpha} \\ y_G = A_G k_G^{\alpha} \\ y_I = A_I k_I^{\beta} \end{array} \quad \text{where} \quad 0 < \alpha, \beta < 1$$

Formalization of the model 2/3

Legal and illegal goods are produced by means of legal goods and the subscripts L, G and I indicates just the sector in which capital is allocated

The dynamic constraints are represented by:

$$\dot{k}_L = y_L - c_L^L - \delta k_L \quad (\text{Accumulation path of legal sector})$$

$$\dot{k}_Z = \dot{k}_G + \dot{k}_I = y_G - c_L^G - \delta(k_G + k_I) \quad (\text{Accumulation path of grey/illegal sectors})$$

$$\text{where } k_G / (k_G + k_I) = z$$

The equilibrium condition in the market of illegal goods is represented by:

$$y_I = c_I$$

Formalization of the model 3/3

The problem can be solved by setting the following current value Hamiltonian:

$$\tilde{H} = (c_L^G + c_L^L)^\gamma C_I^{(1-\gamma)} + \lambda_L (A_L k_L^\alpha - c_L^L - \delta k_L) + \lambda_Z (A_Z k_Z^\alpha - c_L^G - \delta k_Z)$$

By applying the maximum principle we get the following equilibria:

$$k_L = \left(\frac{\alpha A_L}{\delta + \rho} \right)^{\frac{1}{1-\alpha}}$$

$$c_L^L = A_L \left(\left(\frac{A_L \alpha}{\delta + \rho} \right)^{\frac{1}{1-\alpha}} \right)^\alpha - \delta \left(\frac{A_L \alpha}{\delta + \rho} \right)^{\frac{1}{1-\alpha}}$$

$$c_L^G = A_G (z k_Z)^\alpha - \delta k_Z \quad \text{where } k_Z \text{ is the solution of the following:}$$

$$A_G (z k_Z)^\alpha \left(-1 + \frac{\alpha \gamma}{\beta(-1+\gamma)} \right) - A_L \left(\left(\frac{\alpha A_L}{\delta + \rho} \right)^{\frac{1}{1-\alpha}} \right)^\alpha + \delta \left(\frac{\alpha A_L}{\delta + \rho} \right)^{\frac{1}{1-\alpha}} + k_Z \left(\delta - \frac{\gamma \alpha A_L \left(\left(\frac{\alpha A_L}{\delta + \rho} \right)^{\frac{1}{1-\alpha}} \right)^\alpha \left(\frac{\alpha A_L}{\delta + \rho} \right)^{-\frac{1}{1+\alpha}}}{\beta(-1+\gamma)} \right) = 0$$

Simulations 1/5

The following graphs are drawn by simulating the behaviour of the model taking into account a given path of the technological factors in the production functions of the legal, illegal and grey sectors

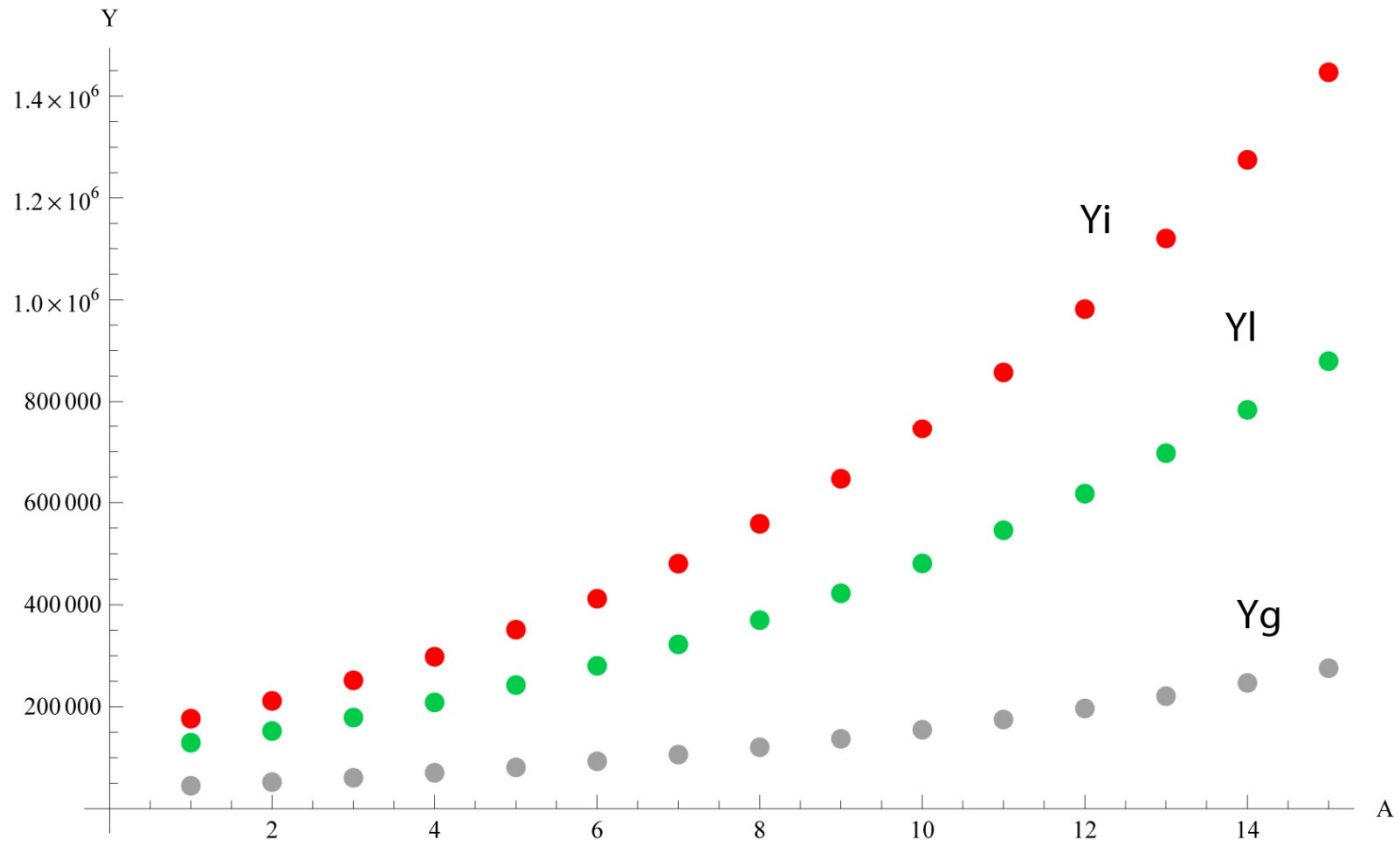
Particularly, we repeated the simulation for 15 different values of the technological factors taking into account their different paths, which have been set in order to have:

1. Growth rate of technology in the legal sector = 0.05

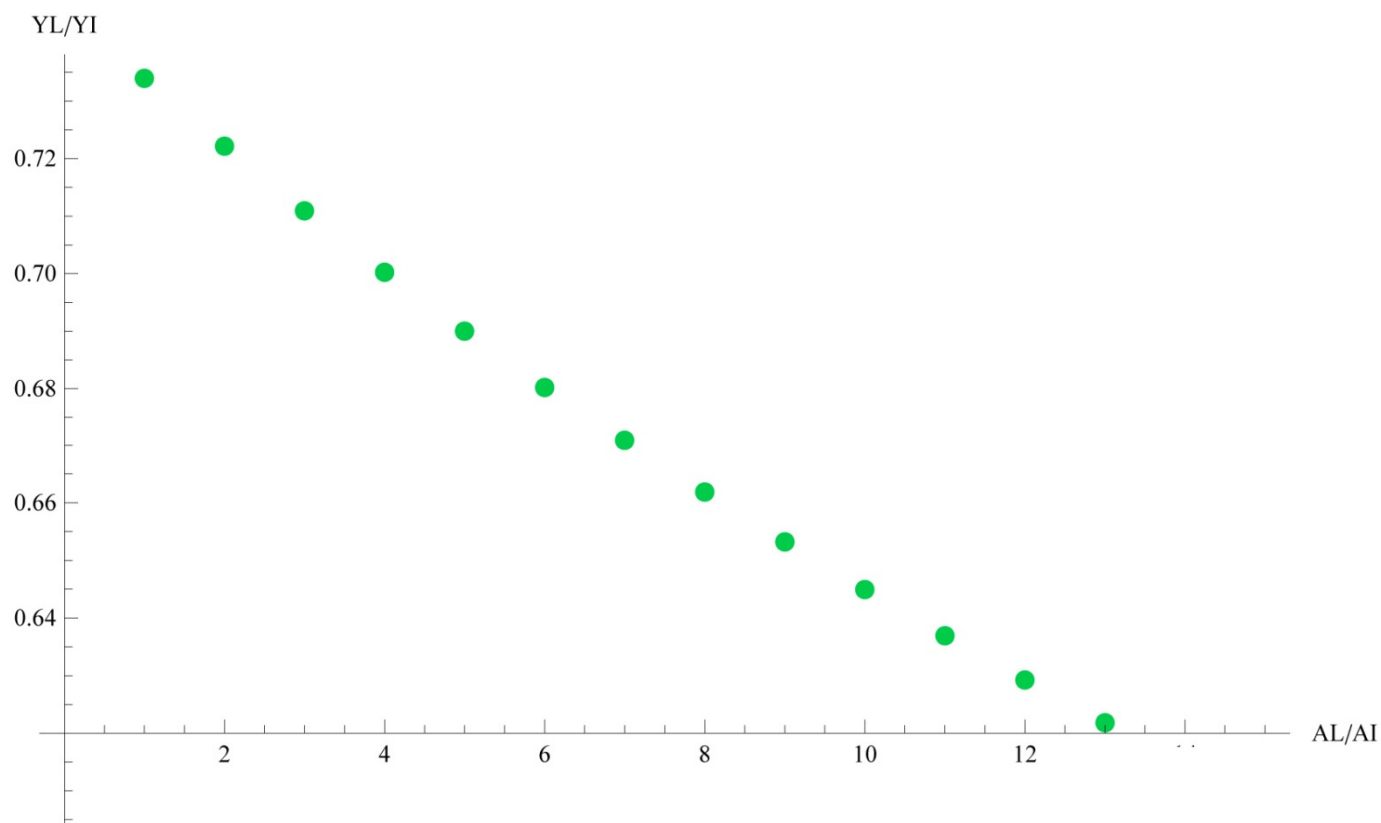
1. Growth rate of technology in the illegal sector = 0.06

1. Growth rate of technology in the grey sector = 0.04

Trend of productions vs. trend of technologies

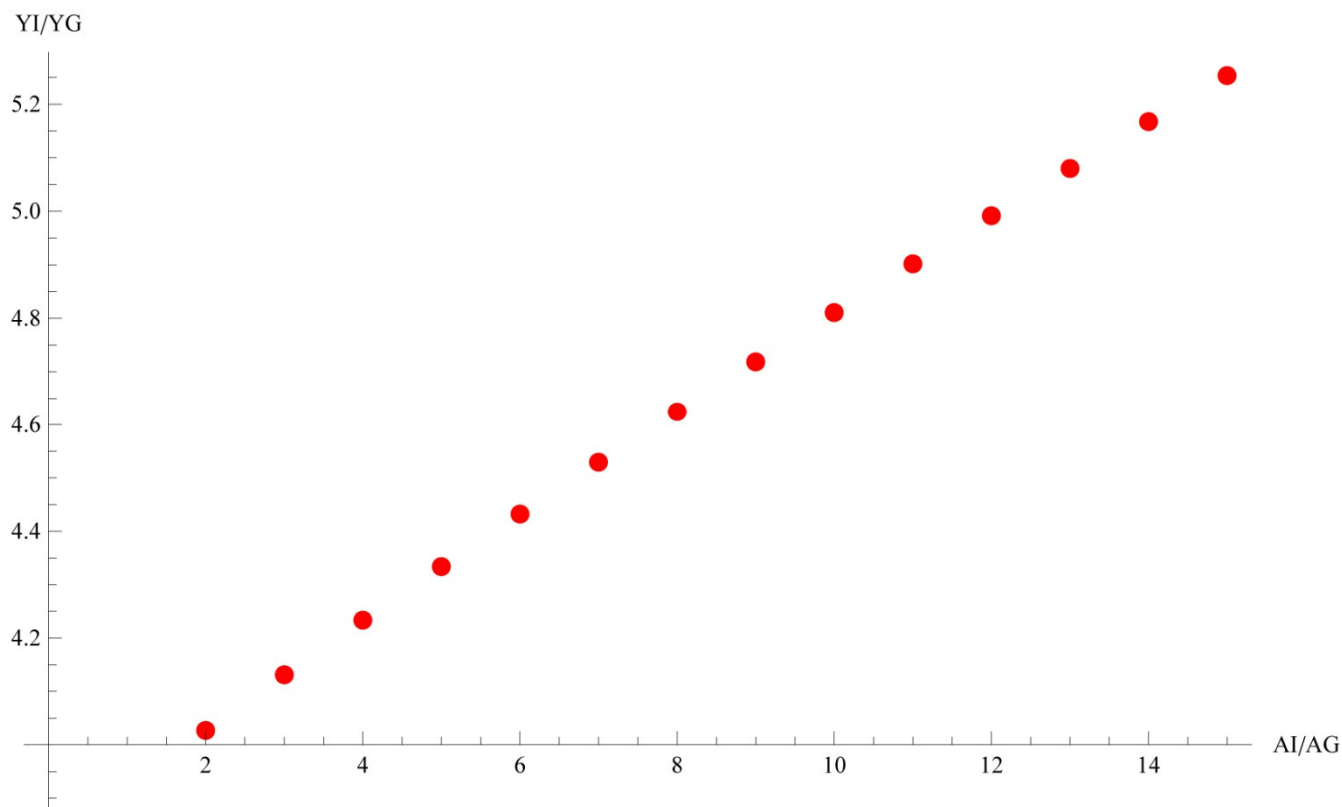


Relative trend of illegal and legal sector vs. relative trend of technologies

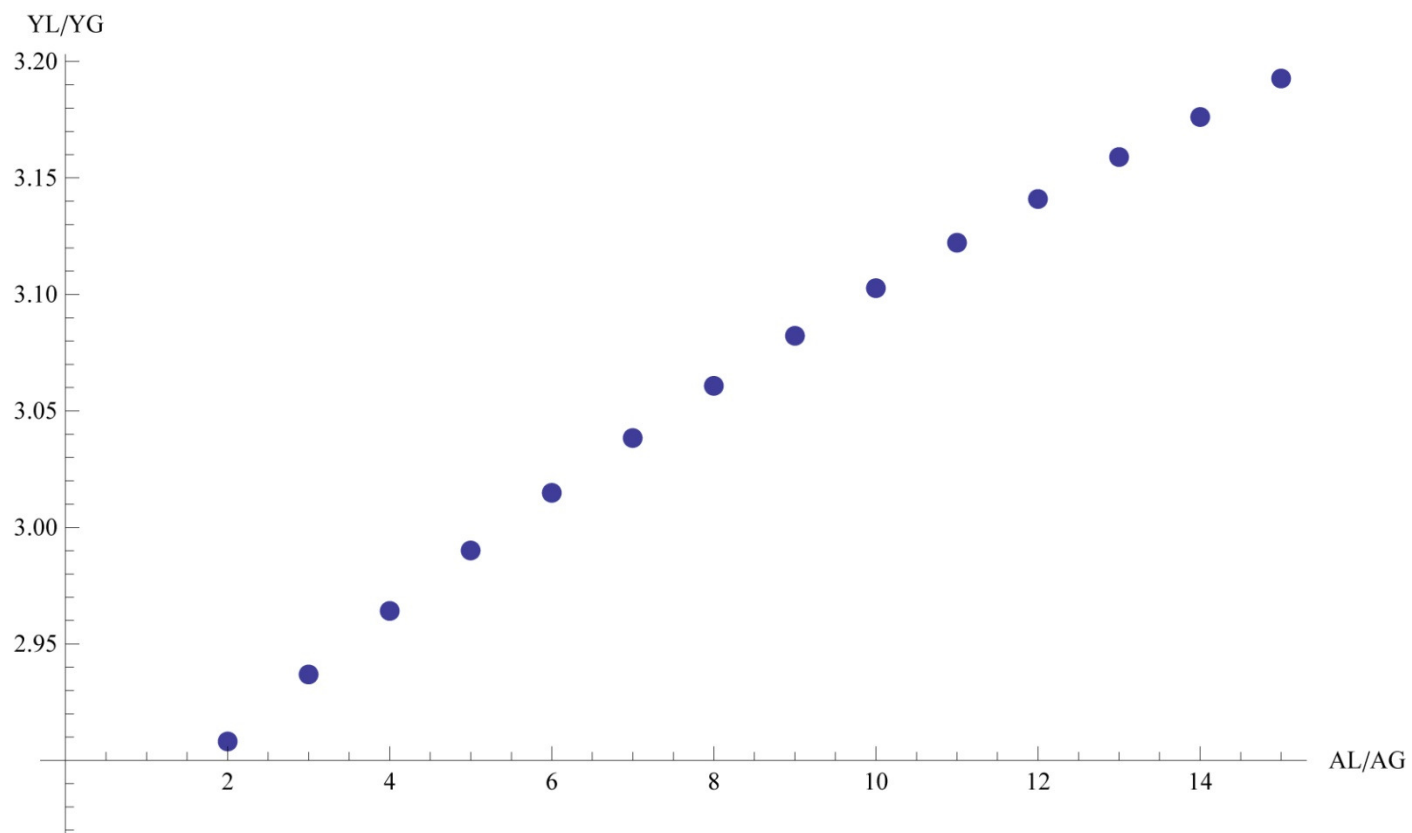


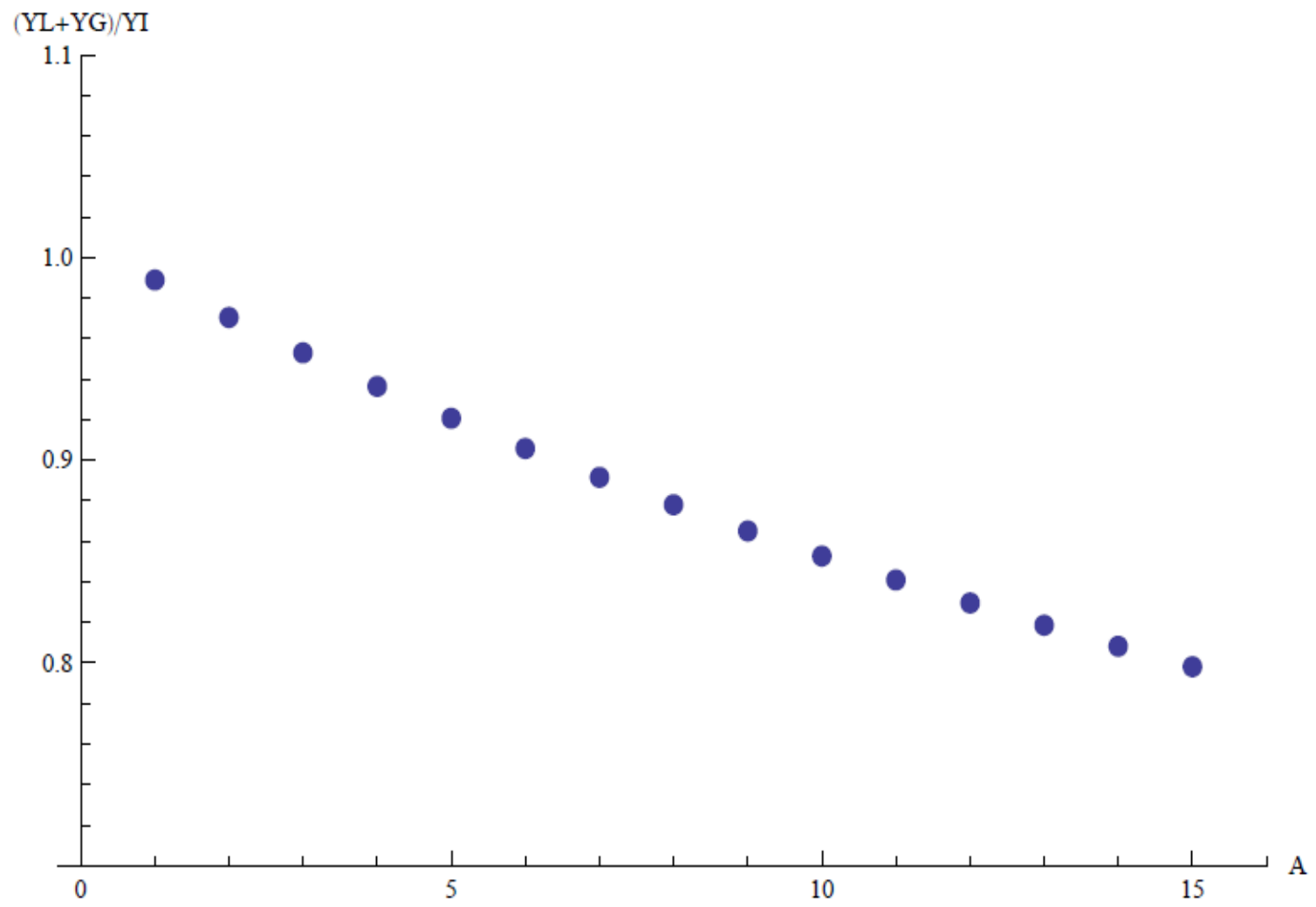
Simulations 4/5

Relative trend of illegal and grey sector vs. relative trend of technologies



Relative trend of grey and legal sector vs. relative trend of technologies





Conclusions

Along the path of technological development, the ratio between legal and illegal productions tends to decrease. This means that the stronger evolution of technologies in the illegal sector is detrimental for the legal sector.

Along the path of technological development, the ratio between illegal and grey productions tends to increase even though the “institutional link” between the two sectors involves a concave trend of this ratio instead of the convex trend implied in the evolution of technologies

Along the path of technological development, the ratio between legal and grey productions tends to increase concavely instead of convexly. This involves that the share of grey economy with respect to the legal sector is wider than the share that would be considered as optimal following the evolutionary trend of technologies
