

A Bioeconomic View of the Neolithic Transition to Agriculture

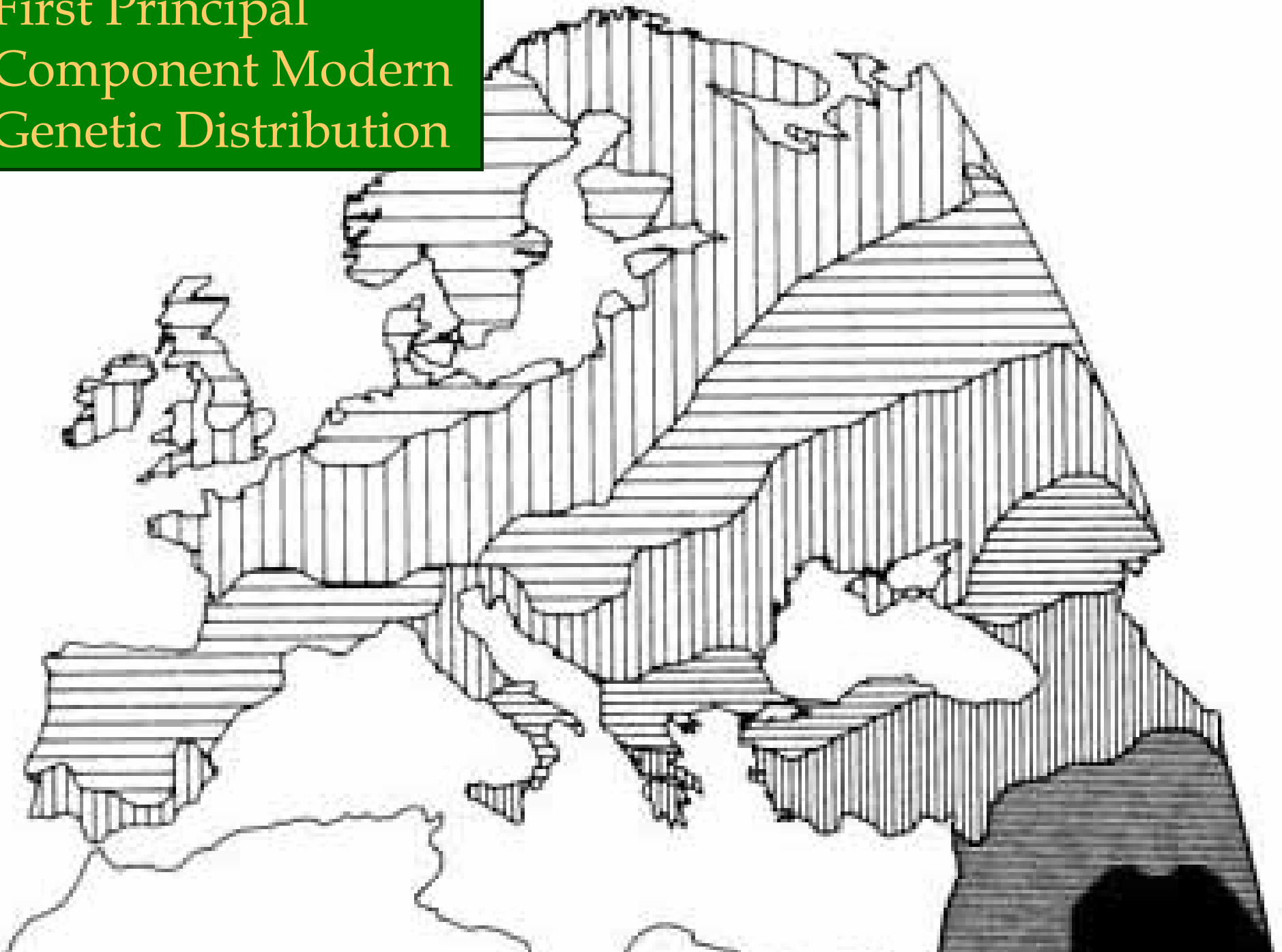
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Spread of agriculture

Based on the arrival of wheat
(kyr = 1000 years)



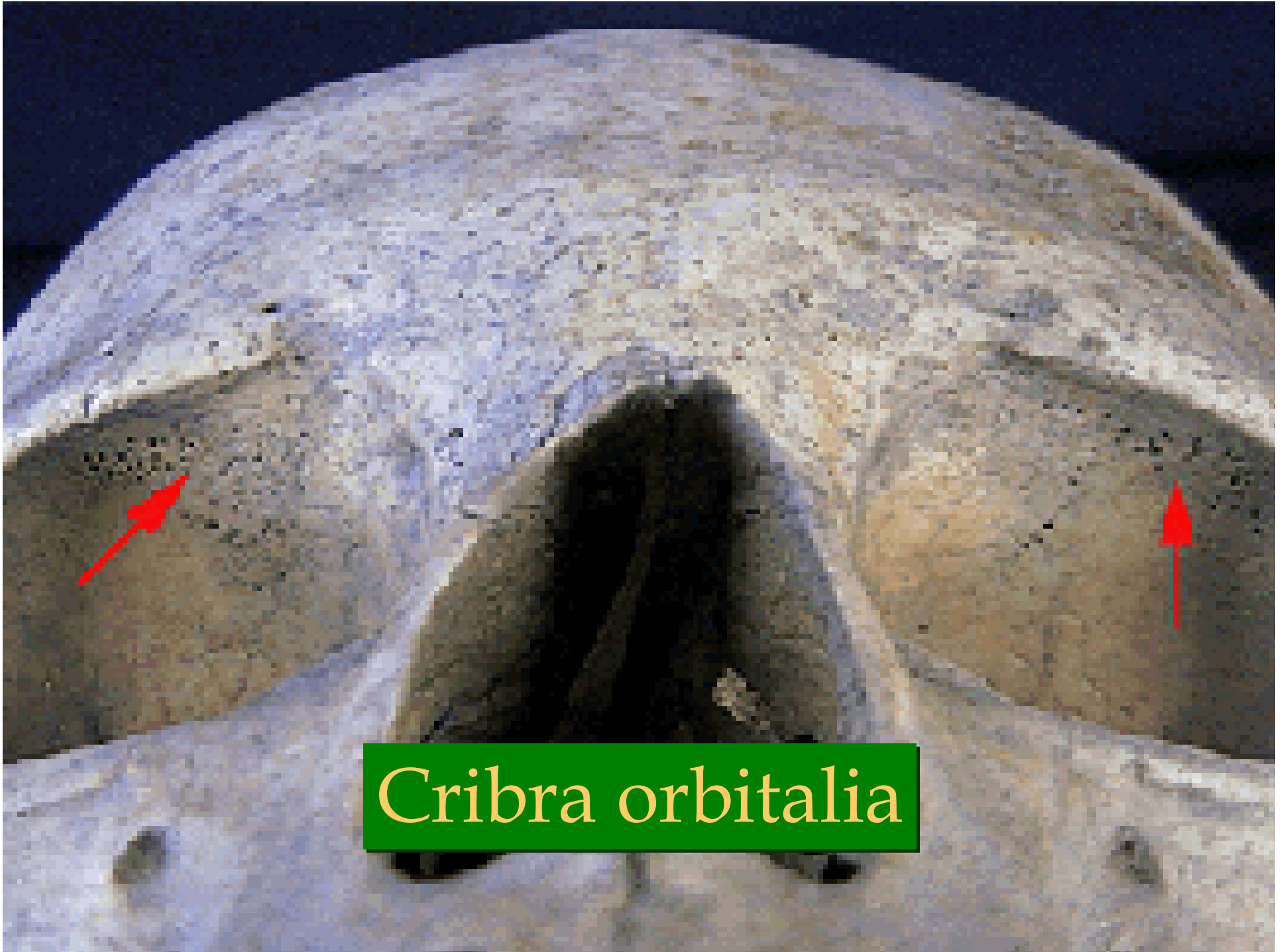
First Principal
Component Modern
Genetic Distribution





Periosteal lesions

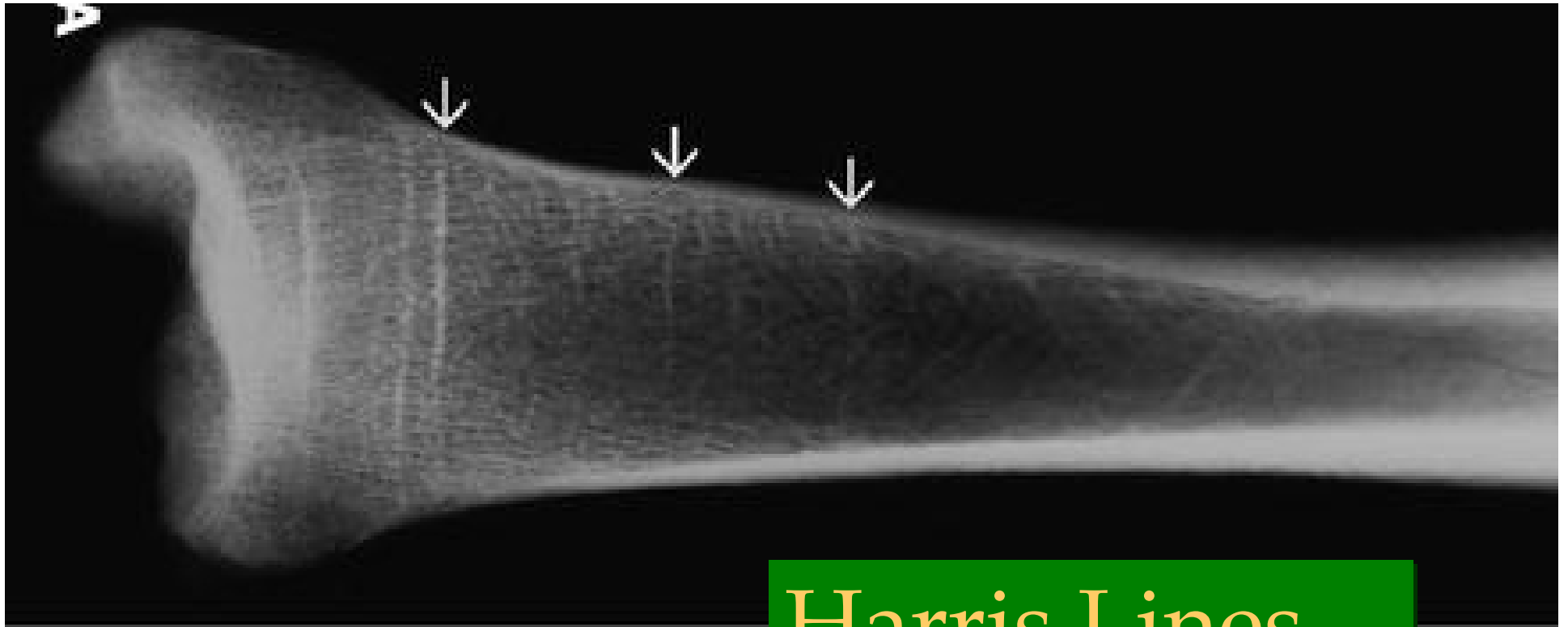
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Cribra orbitalia



Cribria orbitalia II



Harris Lines



1 cm

Enamel hypoplasia



FORAGING TO FARMING.

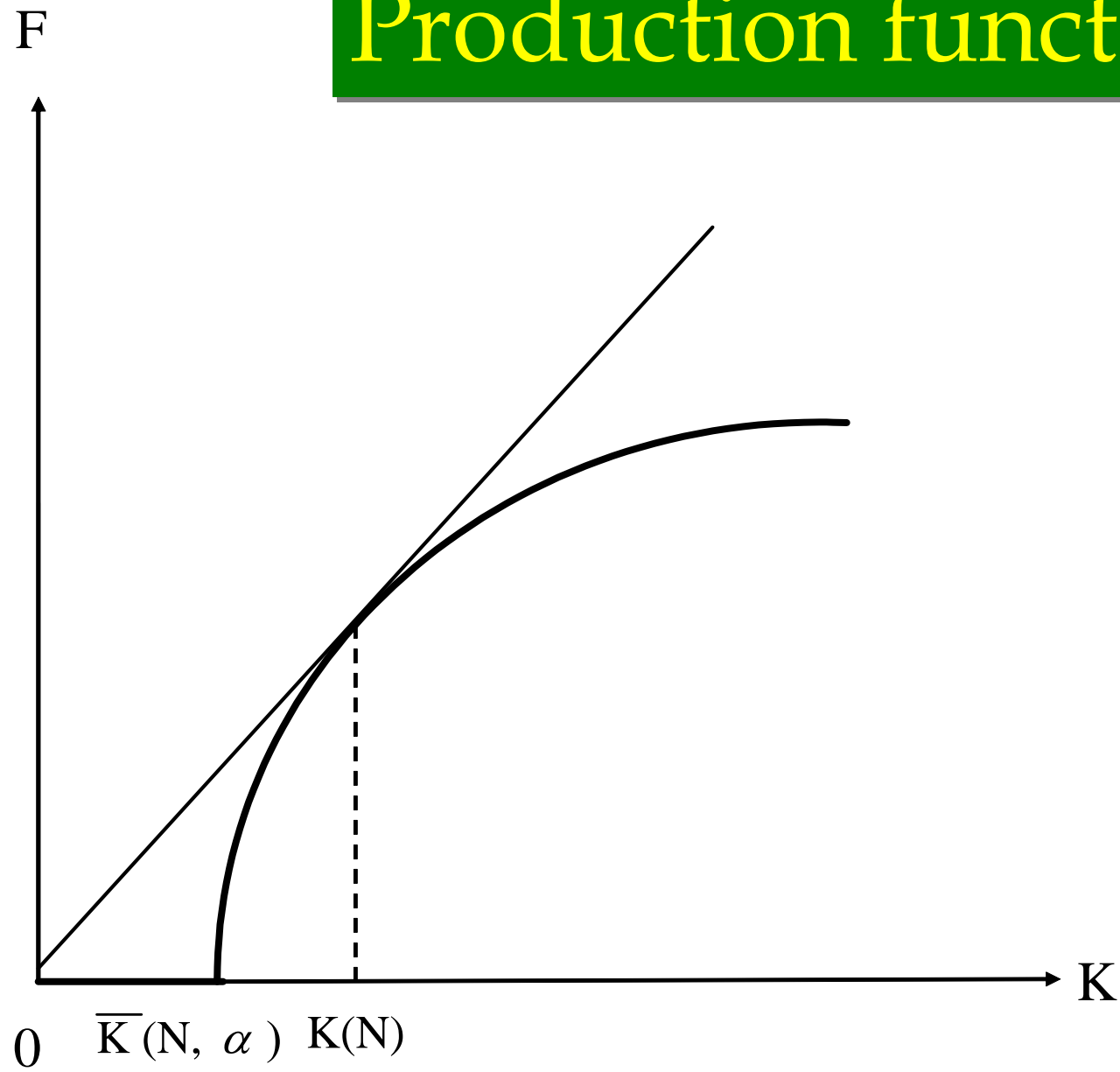
Two overlapping generations. Parthenogenesis. Somatic capital, $K > 0$.
Number of adults, N . α reflects agriculture. Production function, F :

Assumption 1. i) There is $\bar{K}(N, \alpha) \geq \bar{K} > 0$ s.t. $F(K, N, \alpha) = 0$, $K \in [0, \bar{K}(N, \alpha)]$; $F_K(K, N, \alpha) > 0$ and $F_{KK}(K, N, \alpha) < 0$, for $K > \bar{K}(N, \alpha)$; and $F_K(K, N, \alpha) \rightarrow 0$, as $K \rightarrow \infty$.

ii) $F_\alpha(K, N, \alpha) > 0$, but $F_N(K, N, \alpha) < 0$; $F_{K\alpha}(K, N, \alpha) \leq 0$ and $F_{KN}(K, N, \alpha) \leq 0$.

Assumption 2. Probability of survival is $p(N) \in (0, 1)$, where $p'(N) < 0$.

Production function



Lemma 1. *There is unique $K(N) = \arg \max_{K \geq \bar{K}} \frac{F(K, N, \alpha)}{K}$ and a unique equilibrium steady state s.t.:*

$$p(N)F_K(K, N, \alpha) = 1 \text{ and}$$

$$p(N)F(K, N, \alpha) = K.$$

Maximization of $\frac{F(K, N, \alpha)}{K}$ is equivalent to maximization of the number of children times the “quality” of each.

COMPARATIVE STATICS OF THE EQUILIBRIUM STEADY STATE.

Theorem 1. $\frac{dN}{d\alpha} > 0$ and $\frac{df}{d\alpha} > 0$ but $\frac{dK}{d\alpha} < 0$. If $\frac{KF_{KKK}}{F_K} > -1$, then $\frac{dF}{d\alpha} < 0$.

DYNAMICS

Dynamics

