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### Referências bibliográficas

ALVES, D.; BELLUZO, W. **Infant mortality and child health in Brazil**. *Economics and Human Biology*, 2(3), p. 391-410, 2004.

AMADEO, E. et al. **A natureza e o funcionamento do mercado de trabalho brasileiro desde 1980**. IPEA, Texto para Discussão 353, 1994.

ARORA, S. **On epidemiologic and economic transitions: a historical view**. In: López-Casasnovas, G.; Rivera, B.; Currais, L. (eds.), *Health and Economic Growth*, MIT Press, 2005, p. 197-238.

BALAND, J.-M.; ROBINSON, J. A. **Is child labor inefficient?** *Journal of Political Economy*, 108(4), p. 663-679, 2000.

BECKER, G. S.; LEWIS, H. G. **On the interaction between the quantity and quality of children**. *Journal of Political Economy*, 81(2), p. S279-288, 1973.

BECKER, G. S.; MURPHY, K. M.; TAMURA, R. **Human capital, fertility, and economic growth**. *Journal of Political Economy*, 98(5), p. S12-S37, 1990.

BECKER, G. S.; TOMES, N. **Child endowment and quantity and quality of children**. *Journal of Political Economy*, 84(4), S143-S162, 1976.

BIRCHENALL, J. **Escaping high mortality**. *Journal of Economic Growth*, 12(4), p. 351-387, 2007.

BLEAKLEY, H. **Disease and development: evidence from hookworm eradication in the American South**. Working Paper, 2004.

BLEAKLEY, H.; LANGE, F. **Chronic disease burden and the interaction of education, fertility and growth.** Working Paper, 2006.

BOLDRIN, M.; JONES, L. E. **Mortality, fertility, and saving in a Malthusian economy.** *Review of Economic Dynamics*, 5, p. 755-814, 2002.

BOLLEN, K. A.; GLANVILLE, J. L.; STECKLOV, G. **Socio-economic status, permanent income, and fertility: a latent-variable approach.** *Population Studies*, 61(1), p. 15-34, 2007.

BONGAARTS, J.; WATKINS, S. C. **Social interactions and contemporary fertility transitions.** *Population and Development Review*, 22(4), p. 639-682, 1996.

BOURKE, J. **Housewifery in working-class England: 1860-1914.** *Past and Present*, 143(May), 1994.

BOYER, G. R. (1989). **Malthus was right after all: poor relief and birth rates in Southeastern England.** *Journal of Political Economy*, 98(11), p. 93-114, 1989.

BROWN, J. C.; GUINNANE, T. W. **Fertility transition in a rural, Catholic population: Bavaria, 1880-1910.** *Population Studies*, 56, p. 35-50, 2002.

BROWN, J. C.; GUINNANE, T. W. **Regions and time in the European fertility transition: problems in the Princeton Project's statistical methodology.** *Economic History Review*, 60(3), p. 574-595, 2007.

CALDWELL, J. C. **Toward a restatement of demographic transition theory.** *Population and Development Review*, 2(3/4), p. 321-366, 1976.

CALDWELL, J.C. **Education as a factor in mortality decline: an examination of Nigerian data.** *Population Studies*, 33(3), p. 395-413, 1979.

CARNEIRO, P.; MEGHIR, C.; PAREY, M. **Maternal education, home environments and the development of children and adolescents.** The Institute for Fiscal Studies, Working Paper 15/07, 2007.

CARVALHO, J. A.; WONG, L. **Fertility transition in Brazil: causes and consequences.** *Notas de Población*, 20(56), p. 107-141, 1992.

CLARK, G. **The condition of the working class in England, 1209 to 2004.** *Journal of Political Economy*, 113, p. 1307-1340, 2005.

CLARK, G. **A farewell to alms: a brief economic history of the world.** Princeton University Press, 2007.

CLARK, G.; HAMILTON, G. **Survival of the richest: the malthusian mechanism in pre-industrial England.** *Journal of Economic History*, 66(3), p. 707-736, 2006.

CONLEY, D.; MCCORD, G. C.; SACHS, J. D. (2007). **Africa's lagging demographic transition: evidence from exogenous impacts of malaria ecology and agricultural technology.** NBER Working Paper 12892, 2007.

CORSEUIL, C. H.; FOGUEL, M. N. **Uma sugestão de deflatores para rendas obtidas a partir de algumas pesquisas domiciliares do IBGE.** IPEA, Texto para Discussão 897, 2002.

CRAFTS, N.; MILLS, T. C. **From Malthus to Solow: how did the Malthusian economy really evolve?.** *Journal of Macroeconomics*, 31, p. 68-93, 2009.

CROIX, D.; LICANDRO, O. **The child is father of the man: implications for the demographic transition.** Working Paper, 2008.

CURRIE, J.; MORETTI, E. **Mother's education and the intergenerational transmission of human capital: evidence from college openings.** *Quarterly Journal of Economics*, 118(4), p. 1495-1532, 2003.

DYSON, T.; MURPHY, M. **The onset of fertility transition.** *Population and development review*, 11(3), p. 399-440, 1985.

DESAI, S.; ALVA, S. **Maternal education and child health: is there a strong causal relationship?** *Population Studies*, 35(1), p. 71-81, 1998.

DE WALQUE, D. **How does the impact of an HIV/AIDS information campaign vary with educational attainment? Evidence from rural Uganda.** World Bank Policy Research Working Paper 3289, 2004.

DE WALQUE, D. **Who gets AIDS and how? THE determinants of HIV infection and sexual behaviors in Burkina Faso, Cameroon, Ghana, Kenya and Tanzania.** World Bank Policy Research Working Paper 3844, 2006.

EASTERLIN, R. A. **An economic framework for fertility analysis.** Studies in Family Planning, 6(3), p. 54-63, 1975.

EASTERLIN, R. A. **How beneficent is the market? A look at the modern history of mortality.** European Review of Economic History, 3(3), p. 257-294, 1989.

EHRlich, I.; LUI, F. T. **Intergenerational trade, longevity, and economic growth.** Journal of Political Economy, 99(5), p. 1029-1059, 1991.

FRIAS, L. A. M.; CARVALHO, J. A. M. **Uma avaliação da fecundidade no Brasil.** Revista Brasileira de Estudos Populacionais, 9(2), p. 193-199, 1991.

FRIAS, L. A. M.; CARVALHO, J. A. M. **Fecundidade nas regiões brasileiras a partir de 1903: uma tentativa de reconstrução do passado através das gerações.** Working Paper, 1994.

GALOR, O.; WEIL, D. **Population, technology, and growth: from Malthusian stagnation to the demographic transition and beyond.** American Economic Review, 90(4), 806-828, 2000.

GENDELL, M. **Fertility and development in Brazil.** Demography, 4(1), p. 143-157, 1967.

GOLDMAN, D. P.; LAKDAWALLA, D. **Understanding health dispersion across education groups.** NBER Working Paper 8328, 2001.

GROSSMAN, M. **On the concept of health capital and the demand for health.** *Journal of Political Economy*, 80(2), p. 223-255, 1972.

HAINES, M. R. **Social class differentials during fertility decline: England and Wales revisited.** *Population Studies*, 43, p. 305-323, 1989.

HANSEN, G. D.; PRESCOTT, E. C. **Malthus to Solow.** *American Economic Review*, 92(4), p. 1205-1217, 2002.

HAZAN, M.; BERDUGO, B. **Child labour, fertility, and economic growth.** *Economic Journal*, 112(October), p. 810-828, 2002.

HOBcraft, J. **Women's education, child welfare and child survival: a review of the evidence.** *Health Transition Review*, 3(2), p. 159-173, 1993.

HOLLINGSWORTH, T.H. **The demography of the British peerage.** *Population Studies*, 18, 1964.

HORTA, C. J. G.; CARVALHO, J. A. M.; FRIAS, L. A. M. **Recomposição da fecundidade por gerações para Brasil e regiões: atualização e revisão.** Working Paper, 2000.

JOHANSSON, R. S. **Death and doctors: medicine and elite mortality in Britain from 1500 to 1800.** Cambridge Group for the History of Population and Social Structure, Working Paper 7, 1999.

JONES, L. E.; TERTILT, M. **An economic history of fertility in the U.S.: 1826-1960.** NBER Working Paper 12796, 2006.

JOHNSON, S. **O mapa fantasma.** Editora Jorge Zahar, 2008.

KALEMLI-OZCAN, S. **Does mortality decline promote economic growth?** *Journal of Economic Growth*, 7(4), p. 411-439, 2002.

KALEMLI-OZCAN, S. **A stochastic model of mortality, fertility, and human capital investment.** *Journal of Development Economics*, 70(1), p. 103-118, 2003.

KALEMLI-OZCAN, S. **AIDS, ‘reversal’ of the demographic transition and economic development: evidence from Africa.** NBER Working Paper 12181, 2006.

KASSOUF, A. L.; SENAUER, B. **Direct and indirect effects of parental education on malnutrition among children in Brazil: a full income approach.** *Economic Development and Cultural Change*, 44(4), p. 817-838, 1996.

KUNITZ, S. J.; ENGERMAN, S. L. **The ranks of death: secular trends in income and mortality.** *Health Transition Review*, 2, Supplementary Issue, p. 29-46, 1992.

LEE, R.; ANDERSON, M. **Malthus in state space: macro economic-demographic relations in England history, 1540 to 1870.** *Journal of Population Economics*, 15(2), p. 195-220, 2002.

LLERAS-MUNEY, A. **The relationship between education and adult mortality in the United States.** *Review of Economic Studies*, 72(1), p. 189-221, 2005.

LLERAS-MUNEY, A.; LICHTENBERG, F. R. **Are the more educated more likely to use new drugs?.** Working paper, 2002.

LORETZON, P.; MCMILLAN, J.; WACZIARG, R. **Death and development.** NBER Working Paper 11620, 2005.

MACHADO, D. C. **Escolaridade das crianças no Brasil: três ensaios sobre a defasagem série-idade.** Tese de Doutorado, Departamento de Economia, PUC-RJ, 2005.

MALTHUS, T. R. **Ensaio sobre a população.** Editora Nova Cultural, 1996.

MARTINE, G. **Brazil’s fertility decline, 1965-95: a fresh look at key factors.** *Population and Development Review*, 22(1), p. 47-75, 1996.

MASON, K. O. **Explaining fertility transitions.** Demography, 34(4), p. 443-457, 1997.

MCCRARY, J.; ROYER, H. **The effect of female education on fertility and infant health: evidence from school entry policies using exact date of birth.** Working Paper, 2008.

MILLER, G. **Women's suffrage, political responsiveness, and child survival in American history.** Working Paper, 2008.

MOKYR, J. **Why 'More work for mother?' Knowledge and household behavior, 1870-1945.** Journal of Economic History, 60(1), p. 1-41, 2000.

MOKYR, J.; STEIN, R. **Science, health, and household technology: the effect of the Pasteur revolution on consumer demand.** In: Gordon, R. e Bresnahan, T. (eds.), The economics of new products. Chicago: University of Chicago Press and NBER, 1997, p. 143-200.

MOSK, C.; JOHANSSON, S. R. **Income and mortality: evidence from modern Japan.** Population and Development Review, 12(3), p. 415-440, 1986.

MORTARA, G. **The Brazilian birth rates: its economic and social factors.** In: Lorimer, F. et al. (eds.), Culture and Human Fertility, Paris, UNESCO, 1954.

MUNSHI, K.; MYAUX, J. **Social norms and the fertility transition.** Journal of Development Economics, 80(1), p. 1-38, 2006.

PRESTON, S. H.; HAINES, M. R. (1991) **The fatal years: child mortality in late nineteenth-century America.** Princeton University Press, 1991.

POTTER, J. E.; SCHMERTMANN, C. P.; CAVENAGHI, S. M. (2002). **Fertility and development: evidence from Brazil.** Demography, 39(4), p. 739-761, 2002.

RAZZELL, P.; SPENCE, C. **The hazzard of wealth: adult mortality in pre-twentieth-century England.** *Social History of Medicine*, 19(3), p. 381-405, 2006.

RAZZELL, P.; SPENCE, C. **The history of infant, child and adult mortality in London, 1550-1850.** *The London Journal*, 32(3), p. 271-292, 2007.

ROSENZWEIG, M. R.; SCHULTZ, T. P. **Schooling, information and nonmarket productivity: contraceptive use and its effectiveness.** *International Economic Review*, 30(2), p. 457-477, 1989.

ROSENZWEIG, M. R.; WOLPIN, K. I. **Testing the quantity-quality fertility model: the use of twins as a natural experiment.** *Econometrica*, 48(1), p. 227-240, 1980.

SASTRY, N.; BUGARD, S. **The prevalence of diarrheal disease among Brazilian children: trends and differentials from 1986 to 1996.** *Social Science and Medicine*, 60(5), p. 923-935, 2005.

SCHULTZ, T. P. **Changing world prices, women's wages, and the fertility transition: Sweden, 1860-1910.** *Journal of Political Economy*, 93(6), p. 1126-1154, 1985.

SMITH, T. L. **Brazil: people and institutions.** Baton Rouge: Louisiana State University Press, 1963.

SOARES, R. **Mortality reductions, educational attainment, and fertility choice.** *American Economic Review*, 95(3), p. 580-601, 2005.

SHORE-SHEPARD, L. **The precision of instrumental variables estimates with grouped data.** Princeton University Industrial Relations Section Working Paper 374.

STRULIK, H. **Economic growth and stagnation with endogenous health and fertility.** *Journal Population Economics*, 17(3), p. 433-453, 2004.



STYS, W. **The influence of economic conditions on the fertility of peasant women.** *Population Studies*, 2, p. 136-148, 1957.

TAMURA, R. **Human capital and the switch from agriculture to industry.** *Journal of Dynamics and Control*, 27(x), 207-242, 2002.

The Times. **The cholera morbus and the sanitary movement.** London, September 13, 1849.

THOMAS, C. **Domestic labour and health: bringing it all back home.** *Sociology of Health and Illness*, 17(3), p. 328-352, 1995.

THOMAS, D.; STRAUSS, J.; HENRIQUES, M. H. **How does mother's education affect child height?.** *Journal of Human Resources*, 26(2), p. 183-211, 1991.

WEIR, D. **Parental consumption decisions and child health during the early French fertility decline, 1790-1914.** *Journal of Economic History*, 53(2), p. 259-274, 1993.

WOOD, C. H.; CARVALHO, J. A. M. **A demografia da desigualdade no Brasil.** Série PNPE 27, IPEA, 1994.

WOODS, R. **The demography of Victorian England and Wales.** Port Chester, NY, USA: Cambridge Universtiy Press, 2000.

WRIGLEY, E. A.; SCHOFIELD, R. **The population history of England, 1541-1871: a reconstruction.** Arnold, London, 1981.

## A Apêndice

### A.1 A condição de primeira ordem no caso geral

O objetivo dos pais é encontrar a combinação de consumo ( $x$ ), número de filhos ( $n$ ), horas dedicadas à saúde ( $t_s$ ) e à educação ( $t_h$ ) dos filhos, horas dedicadas à trabalho no mercado ( $t_l$ ) e o montante de capital humano dos filhos ( $h_c$ ) que maximize a utilidade

$$U = x^{\alpha_1} (ns)^{\alpha_2} (h_c + h_0)^{\alpha_3}$$

sujeita às restrições:

$$h_c(t_h, t_s) = A(s(t_s))(h_p + h_0)t_h \quad (\text{A-1})$$

$$T = t_l + n(\mu + t_s + t_h) \quad (\text{A-2})$$

$$t_l(h_p + h_0) = x + n(\rho + \sigma t_s) \quad (\text{A-3})$$

onde

$$s(t_s) = s_0 + \delta(1 - \exp(-t_s)).$$

é a tecnologia doméstica de saúde tal que  $\delta \equiv s_1 - s_0$ .

Aplicando o log na função de utilidade dos pais e definindo, respectivamente,  $\mathcal{L}$ ,  $\lambda$ ,  $\theta$  e  $\psi$  como o lagrangeano e os multiplicadores associados à cada restrição, temos:

$$\begin{aligned} \mathcal{L} = & \alpha_1 \log x + \alpha_2 \log n + \alpha_2 \log s(t_s) + \alpha_3 \log(h_c + h_0) \\ & + \psi A[s(t_s)]t_h(h_p + h_0) + \theta[T - t_l - (\mu + t_s + t_h)n] \\ & + \lambda[t_l(h_c + h_0) - c - (\rho + \sigma t_s)n] \end{aligned}$$

Supondo solução interior para  $x$ ,  $n$  e  $t_l$ , a condição de primeira ordem

será dada pelo seguinte sistema de equações:

$$\frac{\alpha_1}{x} = \lambda \quad (\text{A-4})$$

$$\frac{\alpha_2}{n} = \theta(\mu + t_s + t_h) + \lambda(\rho + \sigma t_s) \quad (\text{A-5})$$

$$\alpha_2 \frac{s'(t_s)}{s(t_s)} + \psi \frac{dA}{ds} s'(t_s) t_h (h_p + h_0) \leq \theta n + \lambda \sigma n \quad (\text{A-6})$$

$$\theta = \lambda(h_p + h_0) \quad (\text{A-7})$$

$$\psi A[s(t_s)](h_p + h_0) \leq \theta n \quad (\text{A-8})$$

$$\frac{\alpha_3}{h_c + h_0} \leq \psi \quad (\text{A-9})$$

A partir das equações A-2, A-3, A-4, A-5 e A-7, chega-se aos valores ótimos do consumo  $x$  e dos multiplicadores  $\lambda$  e  $\theta$ :

$$x = \frac{\alpha_1}{\alpha_2 + \alpha_3} T(h_p + h_0) \quad (\text{A-10})$$

$$\lambda = \frac{\alpha_1 + \alpha_2}{T(h_p + h_0)} \quad (\text{A-11})$$

$$\theta = \frac{\alpha_1 + \alpha_2}{T} \quad (\text{A-12})$$

As três equações aplicam-se tanto para o equilíbrio malthusiano quanto para o equilíbrio moderno.

### A.1.1

#### Condição de primeira ordem no equilíbrio malthusiano

Vamos agora caracterizar o equilíbrio malthusiano, ou seja, aquele em que os pais não investem no capital humano dos filhos. Nesse equilíbrio, o capital humano dos pais se restringe ao capital humano básico, de forma que  $h_p = 0$ , e não há investimento no capital humano dos filhos, de forma que os pais irão escolher  $h_c = t_h = 0$ . Impondo essas hipóteses na condição de primeira ordem temos que A-7, A-8, A-9 e A-11 implicam

$$n(t_s) = \left( \frac{\alpha_2}{\alpha_1 + \alpha_2} \right) \frac{Th_0}{\rho + \mu h_0 + (\sigma + h_0)t_s} \quad (\text{A-13})$$

enquanto A-5, A-6 e A-7 implicam

$$R(t_s) \leq C(t_s)$$

onde  $R(t_s) \equiv s'(t_s)/s(t_s)$  e  $C(t_s) \equiv [(\rho + \mu h_0)/(\sigma + h_0) + t_s]^{-1} = -n'(t_s)n(t_s)$ , sendo que a desigualdade estrita irá prevalecer na solução de canto  $t_s = 0$ .

As duas condições acima determinam, respectivamente, o número ótimo de filhos e de horas dedicadas aos cuidados com a saúde de cada um deles no regime malthusiano.

### A.1.2

#### Condição de segunda ordem no equilíbrio malthusiano

A verificação da condição de segunda ordem é facilmente obtida se notarmos que no equilíbrio malthusiano o problema dos pais se simplifica. No regime malthusiano,  $h_p = h_c = t_h = 0$  e  $x = \frac{\alpha_1}{\alpha_1 + \alpha_2} T h_0$ . Substituindo esses valores na função de utilidade dos pais, vemos que problema se torna simplesmente encontrar o número de horas dedicadas à saúde cada filho de forma a maximizar

$$\ln(n(t_s)) + \ln(s(t_s))$$

onde  $n$  é dado por A-13. Portanto, a condição de segunda ordem para a maximização é que a função acima seja côncava em  $t_s = t_s^*$ :

$$\frac{d^2}{dt_s^2} [\ln(n(t_s^*)) + \ln(s(t_s^*))] = \frac{d}{dt_s} \left[ \frac{n'(t_s^*)}{n(t_s^*)} + \frac{s'(t_s^*)}{s(t_s^*)} \right] < 0. \quad (\text{A-14})$$

Com um pouco de álgebra, é possível mostrar que a condição de segunda ordem pode ser reescrita como:

$$\left( \frac{n'(t_s^*)}{n(t_s^*)} \right)^2 - \left( \frac{s'(t_s^*)}{s(t_s^*)} \right)^2 - \frac{s'(t_s^*)}{s(t_s^*)} < 0 \quad (\text{A-15})$$

Pela condição de primeira ordem, os dois primeiros termos se cancelam e, como o terceiro termo é positivo, a condição de segunda ordem é satisfeita.

### A.2

#### Equilíbrio com crescimento

No equilíbrio com crescimento, o capital humano básico se torna assintoticamente irrelevantes; assim, podemos supor  $h_0 = 0$ . Além disso, considerando apenas soluções interiores, A-6, A-8 e A-9 da condição de primeira ordem se tornam igualdades. Substituindo A-9 em A-8 e utilizando A-1, chega-se à solução para o número de filhos:

$$n = \frac{\alpha_3}{\alpha_1 + \alpha_2} \frac{T}{t_h}.$$

Substituindo o resultado acima na equação A-5 e utilizando as soluções para os multiplicadores  $\lambda$  e  $\theta$  dadas pelas equações A-11 e A-12, respectiva-

mente, encontramos que o tempo investido na formação do capital humano dos filhos é dado por

$$t_h = \frac{\alpha_3}{\alpha_1 - \alpha_2} \left( \mu + t_s + \frac{\rho + t_s}{h_p} \right)$$

Como no equilíbrio moderno há acumulação de capital humano com retornos constantes, então  $h_p \rightarrow \infty$ ; logo o último termo dentro do parênteses desaparece; portanto:

$$t_h = \frac{\alpha_3}{\alpha_1 - \alpha_2} (\mu + t_s)$$

Finalmente, na equação A-6, colocando-se  $s'/s$  em evidência e substituindo as equações para  $n$ ,  $t_h$ ,  $\lambda$  e  $\theta$ , chega-se a:

$$(\alpha_2 + \alpha_3 \epsilon_s^A) \frac{s'(t_s)}{s(t_s)} = \frac{\alpha_2 - \alpha_3}{\mu + t_s}.$$