# National flags, national flag colors, and the well-being of countries

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# National flags, national flag colors, and the well-being of countries

Voxi Heinrich Amavilah

**Abstract:** This paper utilizes a simple production function model to assess the relative importance of national flags and national flag colors on the well-being of 93 nations in 2007. It finds that the existence of national flags affects well-being positively. Well-being is inelastic with respect to national flag colors. In other words, it is far more important to well-being to have a national flag than whether the flag is a certain color combination. There is considerable regional variation, but the effects of national flags on well-being are invariant with respect to region. **JEL Code:** O15, O11, C21, D31, C51, D60

**Keywords:** National well-being, human development index (HDI), national flags, national flag colors



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## 1. The problem

The problem for this paper is to estimate the effects on socio-economic well-being of national flags and national flag colors. This is an important problem because flags and their colors, such as a Red, White, and Blue for the USA, are power symbols.[1] At the very least they represent national autonomy; at the most they signal socio-political power and economic nationalism within countries and economic imperialism for the larger and more powerful nations.

The power of national flags and flag colors is evident from their prominent displays on government buildings and other spaces locally, and internationally at the United Nations HQ in New York City and gathering places for say the Olympic Games and World Soccer Cup games. However, there is no research (I am aware of) that demonstrates in a quantitative way the economic significance of national flags and flag colors. If national flags and flag colors are important to the economic well-being of nations, what specifically gives them that force? Is it their simple existence to the extent they imply national freedom for the country to make its own decisions on how to use their resources, or is there something deeper so that countries with certain flag colors do better or worse than others? The objective of this paper is to examine these and similar questions.

The paper proceeds as follows. In Section 2 I describe briefly the importance of national flags, and the effects on behavior that experts attribute to color. I then speculate guardedly what the impact of color might be on the macroeconomic behavior of nations. Section 3 conceptualizes a framework consisting of a modified neoclassical (welfare) production function of a representative country in which the national flag and national flag colors are variables of interest. In the same section I also describe the data before putting them to use in Section 4. Section 5 presents the results, and the tentative conclusion is in the last section.

## 2. National flags and flag colors

Flags, of all kinds, have been around for centuries (Los Angeles Chinese Learning Center, 2008). *Vixillium* is the Latin word for flag, and it means a "guide" - a symbolic signal of important information. This is the role still associated with common flags as evident from flags like the "white flag," "red flag," "Jolly Roger," and so on (Wikipedia, 2008). National flags are believed to have started in 3000 BC Iran, and they have become influential symbols within and without national borders. For example, the Union Jack (British flag) first represented British imperial power, but now it remains a symbol of cultural ties between Britain and her former colonies. The Danneborg of Denmark, reportedly the oldest national flag still in use, inspired the national flags of the other Scandinavian countries and Finland.

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[1] See for example President George W. Bush's Proclamation 8155 of June 5, 2007 Flag Day and National Flag Week, 2007". Available at http://edocket.access.gpo.gov/cfr_2008/janqtr/pdf/3CFR8155.pdf.

The existence of a national flag does not require a color. Early national flags were made of different materials including wood and metal, and had only one or two colors. According to Wikipedia (2008) the Netherlands's Tricolor was the first multicolor national flag. It inspired the US, Russian, Indian, and French flags. The French flag in turn influenced the Costa Rican, Dominican Republic, Irish, Haitian, Italian, Romanian, and Mexican flags. Cuba, Liberia, Chile, and Uruguay took after the USA, while Slovak nations like Slovakia, Serbia, Croatia, and Slovenia followed Russia.

Iran, where it all began, inspired the flag colors of Tajikistan, Kurdistan, Bulgaria, Kuwait and Oman. National flags of most Arab nations take after the flag used during the Great Arab Revolt of 1916-1918 against the Ottoman Empire, just as most African flags are based on the Ethiopian flag. The modern Ethiopian flag appears to have Italian, Arab, and Iranian influences in it.

Flags and their colors also evolve to reflect defining moments in history. The flag of the former Soviet Union influenced China, Vietnam, Angola, and Mozambique. Venezuelan flag inspired the Colombian and Ecuadorian flags, whereas the Argentinian flag is evident in the flags of Guatemala, Honduras, El Salvador, and Nicaragua. The point, again, is that the existence of national flags and the historical linkages between and among flag colors are indisputable. What is unknown is whether or not there exists some meaningful correlation between national flags and flag colors on one hand, and the economic well-being of nations on the other hand. There is no reason not to believe that there is some correlation. For one thing, colors have meaningful effects on the human condition (feelings, moods, emotions). The human condition motivates active or reactive behavior, see, e.g., http://www.factomonsters.com/ipka/A0769383.html). But color also has different meanings for different people (factmonster.com, 2008, infoplease.com, 2008, squidoo.com, 2008, precisionintermedia,com, 2008). For instance, red (blood), which the most common flag color, means danger in some cultures (as in spilling blood). In other cultures red means love (as in blood is thicker than water, so to speak). In either case a feeling of danger is likely to induce a different effect on productivity than a feeling of love.

How, and whether or not, color impacts national productivity and therefore well-being is the problem for this paper. We know already from Daggert, Cobble, and Gertal (2008) that "research has demonstrated that specific colors and patterns directly influence the health, morale, emotions, behavior, and performance of learners, depending on the individual's culture, gender, and developmental level, the subject being studied, and the activity being conducted" (p.1). Based on such evidence Danish law has since 2003 required colorful learning environments in schools. Color is also found to enhance productivity in commercial and industrial settings: it increases efficiency, safety, quality control, space, and freshness of thought and ideas (Youngberg, Undated). To the extent citizens of different countries are likely to be proud of their national flags, it is correspondingly likely that flags and flag colors have effects on the macroeconomic behaviors of nations that, perhaps, motivate hard or smart work efforts that ultimately

translate into improved well-being. If so, what is the relative magnitude of such effects? Again, that is the objective of this paper.

## 3. The framework

This section describes a simple framework around which the empirical analysis later depends. The transformations I rely on are not new, but the use is.

### *3.1 The model*

To estimate the impacts of flags and flag colors on the national well-being of countries, I measure well-being with the human development index (HDI). This choice is dictated by the fact that many analysts now prefer the HDI to gross domestic product (GDP) as a measure of well-being, because the HDI averages broad accomplishments of a country over three basic dimensions of human socio-economic development: (a) the knowledge (education) of the population (q1), (b) the health and longevity of the population (q2), and ( c) the material standard of living of the population (X). The education dimension consists of the adult literacy rate (contributing two-thirds to total knowledge), and the ratio of gross (primary, secondary, and tertiary education) enrollment to the adult population (contributing one-third to total knowledge). The health dimension is proxied by life expectancy at birth of the population, while the standard of living is the logarithm of per capita GDP in purchasing power parity (PPP) terms. Thus, HDI is a broader indicator of well-being than GDP per capita ( Clark and McGillivray, 2007).[2]

However, since the work of Gunnar Myrdal (1968), T.W. Schultz (1981), Mark Blaug (1970), Cohn (1979), and most certainly Gary Becker (1996), there has been a clear recognition that the health and education of the population are themselves just components of the human capital (H) dimension of the population. Hence, for N the economically-active population

$$NHDI = H^{a} X^{b}, \quad a+b \geq 1, \tag{1}$$

where N exp(HDI) is population-inflated well-being, $a$ and $b$ are weights of H and X.

The extant literature measure of H as raw labor (L) adjusted for quality (Jones, 1997, Hall and Jones, 1999). However, Amavilah (2008a, b) argues that such a measure overstates the importance of H as a primary factor of production and understates its role in other economic activities, such as the diffusion of innovations and technologies. The appropriate source of H is the entire economically-active population, i.e,

[2] For technical definitions, including calculations of HDI see appropriate references.

$$H=e^{\phi q}N, \tag{2}$$

for $q$ the vector of infrastructural aspects of the quality of the population, such as education (knowledge = q1), health (q2), as well as superstructural aspects like beliefs, assuming $q=\frac{2}{3}q1+\frac{1}{3}q2 \Rightarrow a=a1+a2=1$. I include in $q$ national symbols like flags and flag colors.

Now, suppose the standard of living is produced according to the standard Cobb-Douglas rule of inference,

$$X=(AL)^{\alpha}K^{\beta}. \tag{3}$$

In (3) let L evolve at the rate of growth of the economically-active population, $n$, so that over time

$$L=e^{nt}. \tag{4}$$

Replacing H and L, and modifying (1) yields

$$N\cdot\exp(HDI)=A^{\alpha b}K^{b\beta}e^{a\phi q+\alpha bnt}N^{a+\alpha b}, \tag{5}$$

where A is the current level of technology, K is physical capital approximated by the percentage of GDP that goes into gross fixed capital formation, and $\alpha$ and $\beta$ are elasticities of labor and capital, respectively.

Since we are dealing with a cross-section of countries at one time t = 1, the N intensity of (5) is the HDI proper:

$$\exp(HDI)=A^{\alpha b}k^{b\beta}e^{a\phi q+\alpha bn}. \tag{6}$$

Thus, taking the natural logarithms of (6) gives

$$\ln(\exp(HDI))\equiv y=A^{\alpha b}\ln A+b\beta\ln k+a\phi q+\alpha bn. \tag{7}$$

Eq. (7) avoids running GDP on HDI, which already includes it. Similarly, because H is part of HDI, I do not enter it in q. Instead q includes flags and flag colors. In this way I can now estimate γ by the regression method.

### *3.2 The data*

I focus on 93 countries for which 2005 data published in 2007 is available (Table 1). Most of such data is readily available. The dependent variable y = ln(exp(HDI)) is available from different places including the UNDP's World Human Development Reports (various), the CIA (various), and even Wikipedia (2008). To calculate $NHDI = N \times HDI$, population (N) in millions comes from the same sources as above. For capital (K) I use percent of GDP that goes into capital formation as given by the IMF's IFS Yearbook (2007).

Although the focus of this exercise does not require it, to recover the weights of HDI I draw H, k, and per capita GDP data from a variety of sources including IMF/IFS, CIA (various), and World Bank' WDRs. The key variables here are the dummies for the flag (existence problem) and dominant flag colors (stability problem, if any). For this I assume that every country's national flag has at least one of primary color (red, blue, and yellow) in it. Moreover, since no country ever thinks of itself as belligerent, I let White indicate the existence of a flag. Other flag colors are then set upon a White background in every country's flag. I assign an arbitrary value of five for the white color, i.e. White = 5.

A scan of national flags indicate Red, Blue, Yellow, Green, and Black as dominant colors (photius.com, 2008, flagpedia.net, 2008). I *arbitrarily* set Blue = 4, Red = 3, Yellow = 2, and Black = 1 The values of other colors are also *arbitrary* combinations of dominant colors. For example Green = Yellow x Blue = 2 x 4 = 8, Purple = Blue x Red = 4 x 3 = 12, Pink = White x Red = 5 x 3 = 15, and Black = 1.

Consider the following three examples. Afghani dominant flag colors are Black and Green set on White. Therefore, the dummy variable for the Afghani flag colors = White + Green + Black = White + (Yellow x Blue) + Black = 5 + 8 + 1 = 5 + (2 x 4) + 1 = 13. China's flag is Red and Yellow, on White, so that the value = White + Red + Yellow = 5 + 3 + 2 = 10. The U.S. flag is Red, White, and Blue, on White. Since White on White is White, the value is White + Red + Blue = 5 + 3 + 4 = 12.

By examining the flags and national flag colors of 93 countries, and coding their dummy values as the four examples above show, I generated Table 1.[3] Column 2 presents White plus the dominant national flag colors. Column 3 gives the coded (dummy) values of national flags colors. The column ranges from six (6) for Sweden to 32 for Paraguay. It is

[3]The coding is arbitrary; I make no claim whatsoever that it is a scientific exercise. It however systematic and easy to replicate, perhaps even improve upon.

**Table 1 National flag color dummy values**
**W**hite = 5, **B**lue = 4, **R**ed = 3, **Y**ellow = 2, **Bl**ack = 1[a]

| Country | National Flag Dominant Color Combinations | National Flag Color Dummy Value |
|---|---|---|
| 1. USA | W + R + B | 12 |
| 2. Canada | W + R | 09 |
| 3. Australia | W + R + B | 12 |
| 4. Japan | W + R | 09 |
| 5. New Zealand | W + R + B | 12 |
| 6. Austria | W + R | 09 |
| 7. Belgium | R + Y + Bl | 07 |
| 8. Finland | W + B | 07 |
| 9. France | W + B + R | 12 |
| 10. Germany | W + R + Y + Bl | 12 |
| 11. Greece | B + W | 08 |
| 12. Ireland | G + W + B | 13 |
| 13. Italy | G + W + B | 13 |
| 14. Luxembourg | R + W + B | 12 |
| 15. Netherlands | R + W + B | 12 |
| 16. Portugal | G + W + R | 17 |
| 17. Slovenia | W + B + R | 12 |
| 18. Spain | W + Y + R | 11 |
| 19. Denmark | W + R | 09 |
| 20. Iceland | W + B + R | 12 |
| 21. Norway | W + R + B | 12 |
| 22. Sweden | Y + B | 05 |
| 23. Switzerland | W + R + B | 12 |
| 24. UK | W + R + B | 12 |

[a]These designations are arbitrary.

| Country | National Flag Dominant Color Combinations | National Flag Color Dummy Value |
|---|---|---|
| 25. Algeria | W + R + G | 17 |
| 26. Benin | G + Y + R + W | 19 |
| 27. Botswana | W + B + Bl | 09 |
| 28. Burkina Faso | W + R + G + Y | 19 |
| 29. Burundi | W + G + R | 17 |
| 30. Cameroon | W + G + R + Y | 19 |
| 31. CAR[a] | B + W + Y + G | 18 |
| 32. Congo, Rep. | W + G + Y + R | 19 |
| 33. Kenya | W + Bl + G + R | 18 |
| 34. Malawi | W + Bl + R + G | 18 |
| 35. Mauritius | W + B + R + G | 20 |
| 36. Morocco | W + R + G | 17 |
| 37. Rwanda | W + Y + B + G | 18 |
| 38. S. Africa | W + Bl + G + R + B | 21 |
| 39. Tunisia | W + R | 09 |
| 40. Uganda | W + Bl + R + Y | 12 |
| 41. Bangladesh | W + G + R | 17 |
| 42. China (Main) | W + Y + R | 10 |
| 43. Fiji | W + R + B | 12 |
| 44. India | W + O + G | 19 |
| 45. Indonesia | W + R | 9 |
| 46. Korea, S. | B + W + Bl + R | 13 |
| 47. Malaysia | W + R + Y + B | 14 |
| 48. Pakistan | W + G | 13 |
| 49. Philippines | W + Y + R | 15 |
| 50. Singapore | W + R | 09 |

[a]Central African Republic.

| Country | National Flag Dominant Color Combinations | National Flag Color Dummy Value |
|---|---|---|
| 51. Sri Lanka | G + O + W + (O X R) + Y | 25 |
| 52. Thailand | W + B + R | 12 |
| 53. Armenia | W + R + B + O | 18 |
| 54. Belarus | W + R + G + ® X W) | 37 |
| 55. Bulgaria | W + G + R | 17 |
| 56. Cyprus | W + G + Y | 15 |
| 57. Czech., Rep. | W + B + R | 12 |
| 58. Estonia | W + Bl + B | 09 |
| 59. Hungary | W + R + G | 17 |
| 60. Kazakhstan | W + B + Y | 10 |
| 61. Kyryzstan | W + R + Y | 11 |
| 62. Malta | W + B + R | 10 |
| 63. Moldova | W + B + Y +R | 14 |
| 64. Poland | W + R | 09 |
| 65. Romania | W + B + R + Y? | 16 |
| 66. Slovak, Rep. | W + B + R | 12 |
| 67. Turkey | W + R | 09 |
| 68. Ukraine | W + B + Y | 10 |
| 69. Egypt | W + R + B + Y | 14 |
| 70. Israel | W + B | 08 |
| 71. Kuwait | G + B + W + R | 20 |
| 72. Libya | W + G | 13 |
| 73. Oman | W + R + G | 17 |
| 74. Qatar | W + R | 09 |
| 75. S. Arabia | W + G | 13 |
| 76. Syria | W + R + G + Bl | 18 |
| 77. Argentina | W + B +Y | 10 |

| Country | National Flag Dominant Color Combinations | National Flag Color Dummy Value |
|---|---|---|
| 78. Bolivia | W + O + Y + G | 21 |
| 79. Brazil | W + G + Y + B | 18 |
| 80. Chile | W + B + R | 12 |
| 81. Colombia | W + Y + B + R | 14 |
| 82. Costa Rica | W + B + R | 12 |
| 83. Dominica | W + O + Y + B + G | 22 |
| 84. Dominic Rep. | W + B + R | 12 |
| 85. Grenada | W + G + Y + R | 19 |
| 86. Guatemala | W + B + G + Y | 18 |
| 87. Honduras | W + B | 08 |
| 88. Jamaica | W + Bl + G + Y | 16 |
| 89. Mexico | G + W + R | 17 |
| 90. Nicaragua | W + B + G | 16 |
| 91. Paraguay | W + R + B + (W x B) | 32 |
| 92. Peru | W + R | 09 |
| 93. Uruguay | W + B + Y | 10 |

**Table 2 Descriptive statistics**[a]

| Name | N | Mean | Se. Dev. | Variance | Minimum | Maximum | Coef. of Variation |
|---|---|---|---|---|---|---|---|
| Country | 93 | 47.000 | 26.991 | 728.500 | 1.000 | 93.000 | 0.574 |
| HDI | 93 | 0.791 | 0.152 | 0.023 | 0.370 | 0.968 | 0.192 |
| Pop (N) | 93 | 57.181 | 182.530 | 33318.000 | 0.070 | 1324.400 | 3.192 |
| GDP(PPP) | 93 | 630.08 | 1703.300 | 2901400.000 | 0.700 | 13844.000 | 2.703 |
| Capital (%) | 93 | 23.058 | 7.319 | 53.561 | 8.940 | 63.780 | 0.318 |
| Life (q2) | 93 | 71.478 | 9.533 | 90.878 | 42.500 | 82.000 | 0.133 |
| Edu (q1) | 93 | 87.034 | 17.150 | 294.110 | 12.800 | 99.900 | 0.197 |
| Flag | 93 | 5.000 | 0.000 | 0.000 | 5.000 | 5.000 | 0.000 |
| Flag colors | 93 | 13.871 | 5.247 | 27.527 | 2.000 | 37.000 | 0.378 |
| N-Growth(n) | 93 | 1.2567 | 2.441 | 5.960 | -0.900 | 22.700 | 1.943 |

[a]N = Population in millions. Life = Life expectancy at birth in years, and Edu = Knowledge = Literacy rate.

**Figure 1- National flags, flag colors, and well-being of nations, 2007**

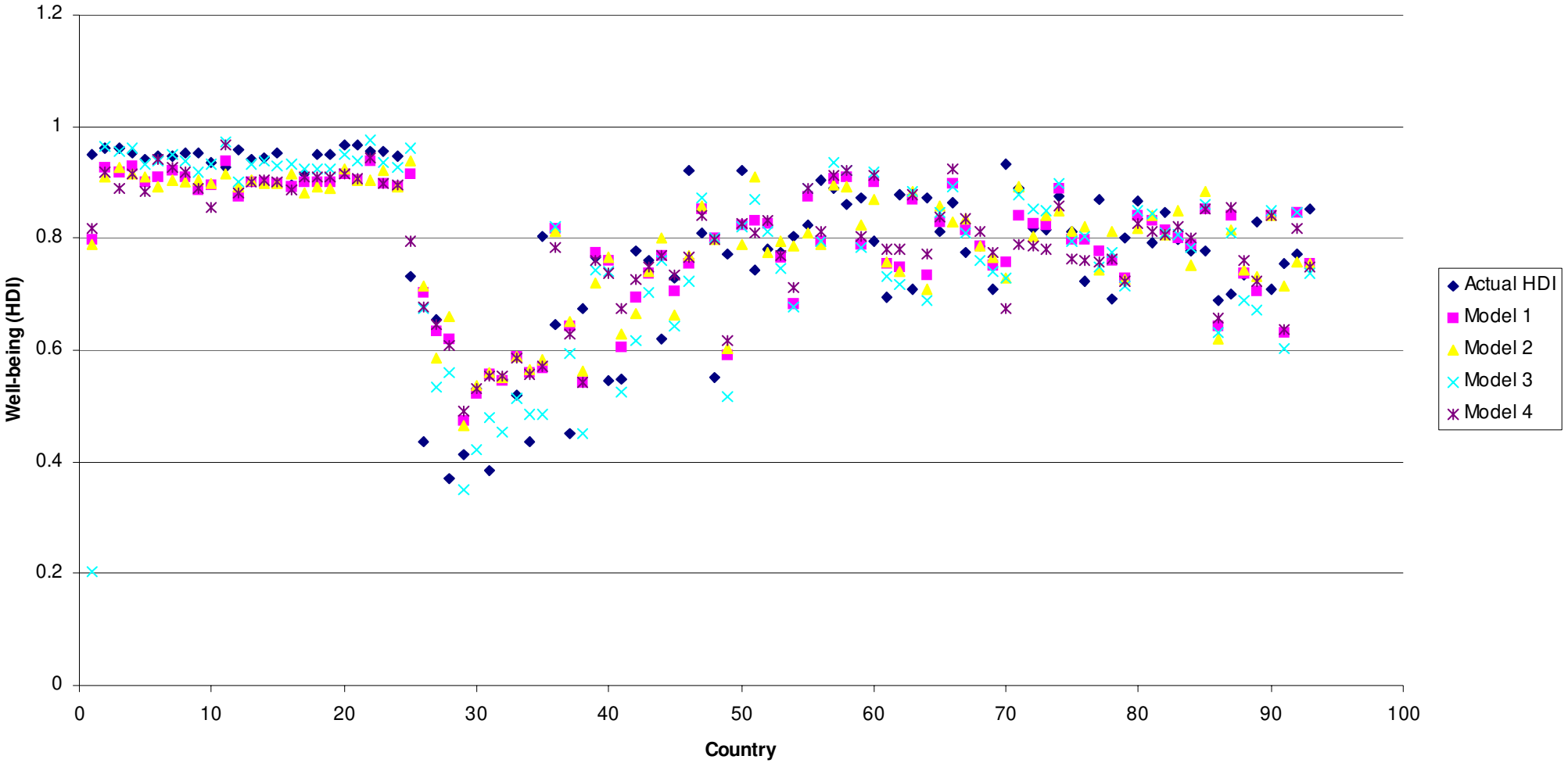
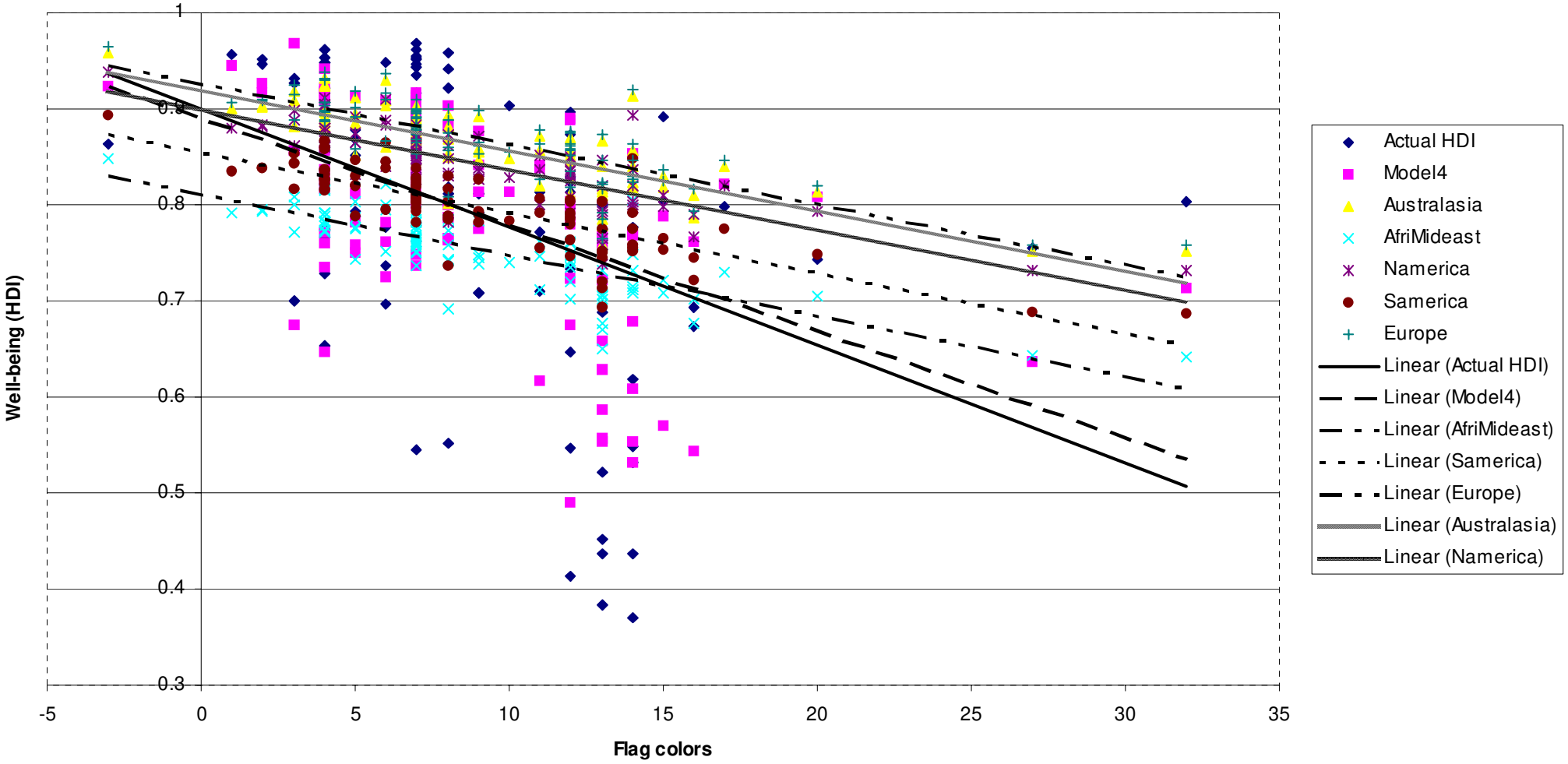


**Figure 2 - Actual and estimated HDI by flag colors**



the variable q in the estimations - which is like an interaction variable, because it includes White. White = 5, is subtracted from Column 3 in some model estimations. Table 2 presents descriptive statistics. It is too obviously to dumb down the reader about it.

**4. Model estimations**

Preliminary estimations began with (1) as

$$\ln(N\cdot\exp(HDI))=C+a1\ln q1+a2\ln q2+b\ln X,???? \tag{8}$$

where C = constant term, $a1+a2=1$, $q1\times q2=H$, $a1+a2+b\geq 1$. Now, given weights $a,b$ (6) becomes

$$y=\gamma 0+\gamma 1\ln k+\gamma 2q+\gamma 3n, \tag{9}$$

where $\gamma 0=\alpha\hat{b}=constant$, $\gamma 1=\hat{b}\beta,\gamma 2=\hat{a}\phi,\gamma 3=\alpha\hat{b}$ are elasticities of HDI with respect to *k*, q, and *n*, respectively. Equation 9 is the principal estimation model.

**5 Results**

From (8) I obtained

$$\begin{aligned} &Y=-2.4155-0.6392\ln q1+0.7799\ln q2+0.8593\ln X\\ &T\text{-}ratios:-14.184;\ 2.3160;\ -1.9284;\ 18.570\\ &\bar{R}^2=0.7703;\ SEE=0.8388;\ \bar{Y}=2.2384;\ LLF=-322.373;\ DW(\rho)=2.1987(-0.10273). \end{aligned} \tag{10}$$

Since $q1\times q2=H$, we can write (10) as

$$Y=e^{-2.4155}H^{0.1407}X^{0.8593}\ \Rightarrow\ a1+a2=0.1407;\ b=0.8593. \tag{10'}$$

Given $\hat{a}$ and $\hat{b}$ (hat = estimated), it means that

$$y=(0.8593\alpha\ln A)+(0.8593\beta)\ln k+0.1407\phi)q+(0.8593\alpha)n. \tag{11}$$

For $\gamma 0=0.8593\alpha\ln A$, $\gamma 1=0.8593\beta$, $\gamma 2=0.1407\phi$, $\gamma 3=0.8593\alpha$, (9) obtains.

**Table 3 - Flags, flag colors and the well-being of nations, 2007**[a]
(Parentheses are T-ratios at the 5 % significance level)

| **Variable (Parameter)** | **Model 1** | **Model 2** | **Model 3** | **Model 4** |
|---|---|---|---|---|
| Constant (γ0) | 0.6441 (5.9648) | None | None | None |
| ln (Capital≡ k) (γ1) | 0.0735 (2.2936) | 0.0705 (2.1248) | 0.0803 (2.6836 ) | 0.0723 (2.1450) |
| **Flag** ≡ q (γ2) | | | | |
| • Existence (White) | | 0.1169 (5.2994) | | |
| • Dominant Colors | | | -0.0046 (-2.8026) | -0.0056 (-2.9586) |
| • Interaction | -0.0051 (-2.9152) | | | |
| Pop-growth≡ n (γ3) | -0.0032 (-0.8219) | -0.0045 (-1.1238) | -0.0021 (-0.5793) | -0.0034 (-0.8181) |
| **Regions** | | | | |
| • AustralAsia | | | | 0.6977 (6.1153) |
| • AfriMideast | | | | 0.5873 (4.9999) |
| • NAmerica | | | | 0.6789 (5.4271) |
| • SAmerica | | | | 0.6296 (5.3271) |
| • Europe | | | | 0.6469 (5.2407) |
| Adj. R-square | 0.5578 | 0.5211 | 0.4874 | 0.5553 |
| SEE | 0.10119 | 0.10531 | 0.10894 | 0.10147 |
| LLF | 82.7896 | 78.5450 | 73.7789 | 84.7807 |
| DW [ρ] | 2.2738 [-0.1561] | 2.3050 [-0.17134] | 2.0768 [-0.21672] | 2.2010 [-0.11698] |
| Normal t | 0.4549 | 0.6591 | 2.5127 | -0.8557 |

[a]Mean HDI = 079073; AfriMideast = African & Middle East; NAmerica = North America, SAmerica = South America.

**Table 4 - Flags, flag colors and the well-being of nations, 2007**
(Parentheses are T-ratios at the 5 % significance level)

| **Variable (Parameter)** | **Model 1** | **Model 2** | **Model 3** | **Model 4** |
|---|---|---|---|---|
| Constant (γ0) | 0.61341 () | None | None | None |
| ln (Capital≡ k) (γ1) | 0.0829 (2.7877) | 0.0838 (2.7126) | 0.0867 (3.1271) | 0.0814 (2.505) |
| **Flag** ≡ q (γ2) | | | | |
| • Existence[a] (White) | | 0.1077 (5.2583) | | |
| • Dominant Colors | | | -0.0047 (-2.9027) | |
| • Interaction | -0.0053 (-3.034) | | | -0.0061 (-3.2504) |
| **Regions** | | | | |
| • Australasia | | | | 0.6301 (5.6325) |
| • Afrimideast | | | | 0.5574 (5.0762) |
| • Namerica | | | | 0.6446 (5.4380) |
| • Samerica | | | | 0.6003 (5.3853) |
| • Europe | | | | 0.6742 (6.2211) |
| Adj. R-square | 0.5594 | 0.5198 | 0.4912 | 0.5582 |
| SEE | 0.1010 | 0.1055 | 0.1085 | 0.10114 |
| LLF | 85.4255 | 77.8892 | 73.6057 | 2.1686 (-0.1029) |
| DW [ρ] | 2.2696 (-0.1524) | 2.2878 (-0.1639) | 2.0865 (-0.2154) | 2.1686 (-0.1029) |
| Normal t -0 | -0.3912 | 0.7491 | 2.5127 | -1.2373 |

[a]In both Table 3 and 4, this variable acts like a constant term which I suppressed to avoid the dummy variable trap.

Given $\hat{\gamma}$

$$\beta=\hat{\gamma}1/b=\hat{\gamma}1/0.8593$$
$$\phi=\hat{\gamma}2/a=\hat{\gamma}2/0.1407 \quad (12)$$
$$\alpha=\hat{\gamma}3/b=\hat{\gamma}3/0.8593.$$

Table 3 and Figure 1 report the four models adjusted for correlation. Across all four models a percent change in capital investment increases national well-being by seven percent. Population growth rate decreases national well-being, and that is an old Malthusian result. What is very interesting is that national well-being is *very responsive* to the existence of a national flag, but *very inelastic* to national flag colors. Generally, all four models fit the data well for the first 24 or so countries with very high national well-being (HDI above 0.80). The next 25 or so countries fall between an HDI of 0.30 and 0.80. The next 45 or so countries are in the 0.6 to 0.97 range. Clearly, national well-being is non-normally distributed across nations as the Normal t-statistic in Table 3 shows; it is in fact V-shaped.

Table 4 gives the results of Table 3 when the negative effect of labor force growth is excluded. The substance of the results is unchanged. For investment and flag variables, for example, the effects are still positive and negative, respectively. Regional variations persist, but with minor reversals. In this case, Europe has the highest intercept rather than North America.

In both Tables 3 and 4, the models are substantially the same. Taking Model 4, given $\gamma,a,b$ estimates, and using (12) I approximate $\alpha=-0.0035,\beta=0.0837,$ and $\phi=-0.0419$. Some simple calculation finds that $ActualHDI\approx HD(\gamma)>HDI(a,b)>HDI(\alpha,\beta,\phi)$. However, I leave that finding to a future pursuit. What I pursue here is that from Table 3 national well-being varies considerably by major geographical regions. To illustrate that fact, I compute regional HDI as

$$RegionHDI=RegionEffect\ +\gamma 1\ln k+\gamma 2q+\gamma 3n,\ RegionEffect=\gamma 0. \quad (13)$$

Figure 2 plots the results, to which I have added trendlines to magnify the differences. On average there is an inverse correlation between national flag colors and national well-being, and Model 4 trendline shows that. In that negative relationship national well-being divides into discernible groups by flag colors. The first group is made up of countries with the values of flag colors lower than 10 and 0.80 < HDI < 1. These are mainly OECD countries. The next group is of countries with dummy values of flag colors that lie between 10 and 15. The national well-being for this group varies from as low as 0.30 to no higher than 0.90. The heavy concentration is in the 0.60 - 0.85 range. The majority of countries in this group are developing countries. And finally there is a smaller number of countries with flag color values above 15, and 0.60 < HDI < 0.80. The trendlines indicate

that the negative relationship is generally the same even as the intercepts vary considerably across nations.

What are we to make of these results? I honestly do not know at this moment, but I make a tentative conclusion next below.

## 6. Tentative conclusion

The basic question for this paper is whether or not national flags, being very important national symbols, affect national well-being measured as HDI. The paper uses a conventional well-being production function and finds that national well-being responds positively to a change in investment and negatively to a change in the growth rate of labor, assumed to be equal to the growth rate of population. I conclude from this that, despite its obvious limitations as a measure of the standard of living, real per capita GDP is still important to the broader indicators of national well-being like HDI. The policy implication is increased investment in things and management of population growth, whatever the latter means.

A major finding of the paper is that national well-being is very sensitive to the existence of a national flag. I take that to mean that nations feel better-off when they are free to make their decisions, which a national flag generally communicates. This makes good; economic and political freedom enhances both GDP and knowledge.

While elastic with respect to the existence of national flags, HDI is inelastic with regard to flag colors. The effects of color that experts observe at the microeconomic level do not apparently show up at the macroeconomic level. This means that although nations are very patriotic about their flags, and often refer to national flag colors in such terms as "Red, White, and Blue" for the USA, apparently national well-being does not depend on them. The existence of a flag whatever its color is key. In fact, countries with fewer national flag colors are better-off than those with complex national flag colors. However, the correlation is not systemic enough to infer causation, and should be interpreted cautiously.

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