

APPENDIX: CURRENT INDICATOR FORMULATIONS¹

Respondents first assessed their “familiarity with technology-intensive development in this country” on a 1-4 scale (1 = less familiar, to 4 = expert).

National Orientation (NO): Evidence that a nation is taking directed action to achieve technological competitiveness. Evidence of such action could be manifested at the business, government, or cultural levels, or any combination of the three.

Formula: $SNO = [SQ1 + S(Q2 + Q3)/2 + SQ4 + SF1V99]/4$

Q1 = *To what extent does this country's government evidence a deliberate strategy to promote technology-intensive production for export?*

Q2 = *To what extent do this country's basic cultural values associate technology and technological change with desirable social development?*

Q3 = *How closely do influential groups (e.g., unions, trade associations, religious organizations) in this country associate technology with desirable social development? For instance, one could imagine some groups not being favorably disposed toward introduction of more technologies. Or, some societies may emphasize redistributive measures, such as land reform, over technology-intensive industrial development?*

Q4 = *Please rate the presence of an "entrepreneurial spirit" in this country. That is, to what extent are its citizens, especially the business community, predisposed toward innovative action and economic risk-taking?*

F1V99 = The *Political Risk Letter* 5-year investment risk assessment index for July 1, 1999,² from the PRS Group [website: <http://www.prsgroup.com>]; rescaled from D- = 1 to A+ = 12. *Political & Economic Forecast Table, Political Risk Letter*, PRS Group, July 1, 1999.

Socioeconomic Infrastructure (SE): The social and economic institutions that support and maintain the physical, human, organizational and economic resources essential to the functioning of a modern, technology-based industrial nation.

Formula: $SSE = [SQ5 + SQ10 + SHMHS99]/3$

Q5 = *Aside from the amount of financial resources, it is also important to assess the extent to which such resources can be mobilized to support technology-intensive development. Please judge the mobility of capital in this country.*

Q10 = *To what extent are foreign-owned firms encouraged to do business in this country?*

HMHS99 = Harbison-Myers Human Skills Index for 1999. The formula for the index is $W499 + 4 * W699$.

W499 = The percentage of students enrolled in secondary education in 1999. The percentage is based on the number of individuals in school vs. the total number of individuals who could be enrolled as defined by UNESCO. Source for W499 and W699 is Table 2.10, *1999 World Development Indicators*, World Bank, 1999.

¹Indicator formulae are written in "S-scores," which means that each indicator and its components are based on a 0 - 100 scale. Depending on the component, three classes of scaling are used:

- Absolute: for questionnaire items on a 1-5 scale, subtract 1 and multiply by 25 to obtain a 0-100 scale.
- Absolute 0; Relative 100: for other items there is a true 0 minimum (e.g., high tech exports cannot be negative) and a relative maximum (i.e., divide by the highest national value).
- Relative 0; Relative 100: for the remaining items, add the most negative country value to the raw scores, then divide by the highest national value to obtain 0-100 scaling.

²Two digit numbers at the end of statistical variables (e.g., F1V99) represent the year from which the data are drawn.

W699 = The percentage of students enrolled in tertiary education in 1999. The percentage is based on the number of individuals in school vs. the total number of individuals who could be enrolled as defined by UNESCO.

Technological Infrastructure (TI): The institutions and resources that contribute to a nation's capacity to develop, produce, and market new technology.

Formula: $STI = [S(Q7+Q8)/2+SQ9+SQ11+SEDP99+SS\&E99]/5$

Q7 = *To what extent is this country capable of replenishing and increasing its supply of qualified, graduate-level (post-baccalaureate) scientists and engineers via local (indigenous) training and educational institutions?*

Q8 = *How would you characterize this country's contribution to the international pool of significant scientific and technical knowledge?*

Q9 = *To what extent do R&D activities in this country relate to industrial enterprise?*

Q11 = *The acquisition of "technological mastery" (the ability to make effective use of technological knowledge) is critical to development of technology-intensive products. To what degree has this country achieved technological mastery?*

EDP99 = Electronic data processing equipment purchases for 1999 as obtained from the Reed Electronics Research [<http://www.rer.co.uk>]. *Yearbook of World Electronics Data 1999/2000*, Reed Business Information Ltd, England, 1999.

S&E99 = The raw number of scientists and engineers engaged in research and experimental development as defined by UNESCO. The reporting year varies greatly by country with the most current data representing 1996. Data reported in the *Statistical Yearbook 1998*, UNESCO, 1998.

Productive Capacity (PC): The physical and human resources devoted to manufacturing products, and the efficiency with which those resources are used.

Formula: $SPC = [S(Q6+Q12+Q13)+SA2699/2]/1.5$

Q6 = *Please rate the quantity and quality of skilled manufacturing labor available in this country.*

Q12 = *To what extent does a system of indigenous producers of components for technology-intensive products exist?*

Q13 = *Please rate indigenous industrial management capabilities to develop, produce, and market technology-intensive products.*

A2699 = The value of total electronics production for 1999 as obtained from the Reed Electronics Research. *Yearbook of World Electronics Data 1999/2000*, Reed Business Information Ltd, England, 1999.

Technological Standing (TS): The current world market share in high technology products, reflecting not only current export market share statistics but also current manufacturing capability.

Formula: $STS = [SQ14i+SX97+SA297]/3$

Q14i = *Please characterize present and future technology-intensive production in this country. Judge the production in each of nine sectors for which you feel reasonably familiar: first, today, and second, 15 years in the future. Part "i" pertains to "Overall technology-intensive production in this country."*

X97 = The value of high tech exports as drawn from the United Nations Statistical Office (UNSO) trade statistics for 1997. High tech exports were defined in accord with the U.S. Department of Commerce's DOC3 definition, excluding missiles and ordinance. It includes STIC Revision 2 codes 51, 52, 54, 58, 712, 713, 714, 716, 718, 75, 76, 772, 776, 792, 87, and 88. All UN trade data is obtained directly from the United Nations Statistical Office.

A297 = The value of electronics exports in 1997 as obtained from the Reed Electronics Research. *Yearbook of World Electronics Data 1999/2000*, Reed Business Information Ltd, England, 1999.

Technological Emphasis (TE): The extent to which a country emphasizes high tech products in its export mix.

Formula: $STE = [SRCP97+SAIS97]/2$

RCP97 = The ratio of high tech exports for 1997 to total exports for 1997. The formula for RCP97 = X97/XCT97.

X97 = The value of high tech exports in 1997 as reported by the UN Statistical Office.

XCT97 = The total exports of a country in 1997 as reported by the UN Statistical Office.

AIS97 = The ratio of electronic exports for 1997 to total exports, including re-exports, for 1997. The formula for AIS97 = (A297/(XCT97)), where XCT97 = total exports, including re-exports, of a country in 1997. The source for XCT is *Direction of Trade Statistics Yearbook*, International Monetary Fund, 1998.

A297 = The value of electronics exports in 1997 as reported by Reed Electronics Research. *Yearbook of World Electronics Data 1999/2000*, Reed Business Information Ltd, England, 1999.

Rate of Technological Change (RTC): An indicator that captures the speed with which a country is expanding its export market share in high tech products.

Formula: $SRTC = [SRDX+SDAEX+SQ14Delta]/3$

$RDX = ((X97-X96)/X96)*.510+((X96-X95)/X95)*.306+((X95-X94)/X94)*.184$

XYX = The value of high tech exports for the year YY specified as drawn from the UN statistical office.

$DAEX = ((A297-A2936)/A296)*.510+((A296-A295)/A295)*.306+((A295-A294)/A294)*.184$

A2YY = The value of electronics exports for the year YY specified as reported by Reed Electronics Research. *Yearbook of World Electronics Data 1999/2000*, Reed Business Information Ltd, England, 1999.

$Q14Delta = (Q14i99-Q14i96)/Q14i96$

Q14i99 = *Please characterize the present overall technology-intensive production in this country.* The answers are drawn from the 1999 survey.

Q14i96 = *Please characterize the present overall technology-intensive production in this country.* The answers are drawn from the 1996 survey.