

More information

Index

absolute advantage (international trade): description, 44, 48n5; Israel and, 48, 51, 57,61 Accenture, 95 Acorn: business strategy of, 138-9, 154; comparison with Fairchild, 137; demise of, 138-9, 140, 142; origins of, 137-8, 149 acquisition: acquisition or merger, 289; description of, 289 Acs. Zoltan, 231 Aditi, 92 agglomeration economies: Cambridge cluster and, 144-7; India's IT and, 103-4; Ireland's IT and, 103-4; sources of efficiency in, 144; success and, 103-4. See also clusters Airtel, 92, 103 algorithms: Massana and, 92; university applications of, 50 American Association of University Related Research Parks, 230, 232 Andhra Pradesh promotion of IT, 113 'angel investing": description, 286-7; in India, 106, 110 Anselin, Luc, 231 Apple, 30 Ariav, G., 51 ARM (Advanced RISC Manufactures), 137, 140, 141 Arora, A., 94, 95, 101, 108, 343 Arrow effect, 340 AT&T, 24, 177 Athena, 63 Athreye, Suma, 346 Autler, Gerald, 66, 67, 68 Autonomy (Cambridge company), 141,

Aztec Software and Technology Services, 110

Baldwin, Ed, 11-12 Baltimore Technologies, 90, 92 Bangalore, India, 79. See also India's IT Banerjee, A., 95 Barkley, David, 235 Beckman, Arnold, 11 Begg, I., 123 Bell Labs symposium (1951), 24 BFL Software, 95 biotechnology: of Cambridge cluster, 130-1, 134, 156t; Israel and, 50, 75 BIRD (Israel-U.S. Binational Industrial Research and Development Foundation), 56, 68 Boland, Stan, 138 Braun, Bradley, 234, 235 Britain and new enterprises, 139 British Petroleum, 133 "business angels." See "angel investing" business models: multinational firms, 87, 96-7; product-oriented firms, 87, 90, 92-3; service-oriented firms, 87, 93-5 Business Week, 206 Butchart, R. L., 154-5, 155t

Cadence, 96
Cambridge City strengths, 128, 130
Cambridge cluster: agglomeration
economies and, 144–7; biotechnology
and, 130–1, 134, 156t; culture and, 153–4;
growth in employment, 124, 124f, 131,
157t; growth in the Cambridge area,
124–7; industrial diversity of, 128, 130–1,
130t; interfirm links of, 146–7, 147t; key



More information

360 Index

Cambridge cluster (cont.) individuals of, 150-1; labor market of, 145-6, 146t; lack of globalization by, 152-4; local market importance, 144-5, 145t; location of, 123; overview, 121-4; R&D and, 128, 130, 131, 142; regional specialization and, 122-3; Silicon Valley differences, 122–3, 152–4; Silicon Valley similarities, 121–2, 151–2; smaller economic scale of, 122; universities and, 148-9, 148t Cambridge cluster development: growth strategies and, 137-42; location factors of, 136-7, 136t; motives for, 135-6, 135t, 136t; planning constraints on, 139, 153; slow growth of firms, 142-4 Cambridge cluster firms: closures/new-firm ratio, 128, 130t; growth of, 127-8, 128t, 129t, 130t, 142-4; increase in, 121, 125-7, 125f, 126t; interfirm linkage importance, 158t; knowledge-based businesses and, 122-3; lack of large firms in, 122, 127-8, 153; origin of firms, 125-7, 126t, 127t; slow growth of, 142-4; startups/spin-offs in, 125-7, 126t, 127t, 132, 133, 143-4 Cambridge cluster institutional developments: corporate venturing, 131, 132; overview, 131-2; University of Cambridge and, 122, 131, 133-4, 147-9, 148t; venture capital, 132-3 Cambridge cluster knowledge transfer: by personnel movement/spin-offs, 149; self-organizing institutions and, 150-1; universities and, 147-9, 148t Cambridge Connect, 134 Cambridge Consultants Ltd. (CCL), 132, Cambridge Futures, 134 Cambridge Network, 134 "Cambridge Phenomenon," 121 Cambridgeshire County statistics, 122 capture ratio, 20 Carmel, Erran, 336, 343, 344 CBR (Centre for Business Research) survey, 125-7, 133, 144-5, 146, 147, 149, 155-6, 156t Central Florida Research Park, 234 Centre for Business Research (CBR) survey, 125-7, 133, 144-5, 146, 147, 149, 155-6, 156t Chang, Morris, 210 Checkpoint Software, 61, 152

Chinese Institute of Engineers (CIE), 219 Chromatis, 50 Cisco, 42 Cleevely, David, 134 clustering theories: NEG, 339-41; NSI, 339, 341-3; urban/regional economics, clusters: cluster effects, 65; competition and, 167-70, 354; complementarity and, 4, 335-6, 348, 350-3; components of, 232, 343-50; cooperation vs. competition with, 350-5; definition, 2, 40; firm formation/building, 346-8; formation and demand, 3, 4, 336; formation vs. sustaining of, 169-70, 334-5, 338; interest in, 1; land/space limits and, 139, 153, 353, 355; new technology and, 1, 285, 335; old/new economy and, 333-4, 338-9; reasons for clustering, 231; "recipe" approach to, 2, 5, 232, 336-7, 344; similarities of, 334-9, 343-50; U.S. linkages and, 3, 169, 350-1. See also specific clusters Cohen, Linda, 252 Cold War and research funding, 16 collectivism, 52-3 comparative advantage: clustering theory and, 343; description, 43-5; India's IT and, 78, 98-9, 100, 101-2; Ireland's IT and, 78, 98, 99-102, 114; Israel's Silicon Wadi, 44-55; Taiwan and, 192-5, 200-4, 205-9, 213, 215-21 competition: clusters and, 167-70, 354; competitive environment and, 167; cooperation vs., 350-5; early Silicon Valley and, 31-5; Internet boom and, 62; licensing businesses avoidance of, 142; localized decentralization and, 218; noncompetitive clause and, 49; primary ICT competitor countries, 42; shared experiences and, 218; spin-offs and, 31-5; Taiwan/Hsinchu region and, 212f, 218; vertical competition, 169 competitive advantage: building on success, 102-15, 105t, 106t; Cambridge and, 143, 143t; focusing on, 34-5; sources of, 97-102. See also market/market access complementarity and clusters, 4, 169, 335-6, 348, 350-3 Comptel, 164 Computer Associates, 74 Conference des Administrations Europeennes de Postes et Telecommunications (CEPT), 173 contingent thinkers, 9 convergence, 316-17, 326-7 conversion services, 94

China: beginnings of cluster development,

224-6; engineer returnees to, 224, 226;

Taiwan IT investments in, 222-4, 223f

Cheng, Fred, 220



More information

Cambridge University Press 978-0-521-14348-6 - Building High-Tech Clusters: Silicon Valley and Beyond Edited by Timothy Bresnahan and Alfonso Gambardella Index

Index 361

cooperation: competition vs., 350-5; complementarity and clusters, 4, 169, 335-6, 348, 350-3 coordination costs and R&D, 73-4 Corel, 96 corporate venturing, 131, 132 Coyle, Bud, 25, 26 creation vs. exploitation, 32 CRM product, 92 cumulative factors: cluster characteristics (Israel), 65-9; in Israel's Silicon Wadi cluster formation, 59-60 Curry, Chris, 137 customer focus: importance of, 169; Israel's Silicon Wadi and, 55, 62, 71, 72, 72n33; Scandinavia and, 178 customer relationship management product, 92 Cyoptics, 50

data security industry, 50 Davis, Kevin, 335, 337 defense spending. See military contracts/spending DeFontenay, Catherine, 336, 343, 344 demand: cluster formation and, 3, 4, 336; generation of, 27-8; India/Ireland IT and, 97, 98; price lowering and, 28, 30-1; Scandinavia and, 161, 183-5 development stages (firm), 290f, 294, 303t, 304-5, 321t, 322 DeVol, Ross, 239 disaggregated industry structure, 37 diversification: advantages/disadvantages, 138; Cambridge cluster and, 128, 130-1, division of labor: advantages of, 216-17; engineers/managers and, 10-15, 345. See also managerial labor DLG (Ireland), 111 dot.com Gold Rush, 37 Dublin, Ireland, 79, 92, 111, 115n39. See

early stage (business) definition, 294
EASDAQ, 140
EC (European Commission), 173, 174
ECI Telecom, 57
e-commerce services/solutions, 94
e-company, 58
Edge, Gordon, 132
education: ICT universities in Scandinavia, 165–6; importance in new clusters, 336; India's IT and, 98–9, 104, 106t; Ireland's IT and, 99–100, 99t; Israel's policy of, 46;

also Ireland's IT

Duflo, E., 95

Dvir, D., 50

scientists/engineers concentration by country, 46f; Taiwan investments in, 195-6, 196f. See also military (Israel) Elbit/El-Op, 50, 58, 68 Electronics Research and Service Organization (ERSO/Taiwan), 195, 196, 197, 203, 209–10, 222 electro-optics: Israel's Silicon Wadi and, 49-50, 56 Electrum research center, 165 El-Op/Elbit, 50, 58, 68 Elron, 57 endowments: factor endowments (Israel), 44-55. See also comparative advantage; labor (skilled) engineers. See scientists/engineers English language importance: India, 98-9; Ireland, 114; Israel, 46; Scandinavia, 162, Enterprise Ireland, 115 enterprise resource planning products, 92 - 3entrepreneurship importance, 2, 334 entry barriers, 86-7 equilibrium models and NEG, 339, 340, Ericsson: cluster description of, 163, 164-6; focus of, 176, 178-9; global market of, 160-1, 179; transformation/success of, 178-9. See also Scandinavia ERP products, 92-3 Etna Valley, Italy, 102n27 EU (European Union), 79, 84, 114 European Commission (EC), 173, 174 European Information Technology Observatory, 98 European Telecommunications Standards Institute (ETSI), 174 European Union (EU), 79, 84, 114 Evans, Chris, 132, 150 exit strategies, 289-90 expansion stage definition, 294 exploitation vs. creation, 32 externalities/cluster theory: cluster value and, 332; direct/indirect types of, 331; in early cluster phases, 335; economic growth and, 332; old/new economy and, 333-4, 338-9; urban/regional economics and, 341

factor endowments: of Israel, 44–55. See also comparative advantage; labor (skilled)
Fairchild, Sherman, 26
Fairchild Camera and Instrument
Corporation, 27
"Fairchild of Israel," 57



More information

362 Index

Fairchild Semiconductor Corporation: "application notes" of, 23; establishment of, 9, 11-12, 25-6; as example, 14, 26; financing of, 26; firm building of, 12-14; general-use products and, 22-3; growth of, 26-7; integrated circuit and, 23, 27-8; internal control and, 27; marketing and, 12; mass production and, 11-12, 13-14; semiconductor basic research and, 19-20; spinning off complementors by, 35; trade secrets misappropriation from, 12; Traitorous Eight and, 9, 25. See also Silicon Valley "Fairchild University," 14 FDI (foreign direct investment), 195, 209 Felsenstein, Daniel, 232, 234-5 Ferguson, R., 234 financial boom: end of, 74; Israel's Silicon Wadi and, 60, 62-3 firewall creation, 61 fixed-fee contracts, 95 Florida, Richard, 235 followers. See latecomers to IT Forbes, 58 foreign direct investment (FDI), 195, 209 Freear, J., 287 Fujita, M., 340, 341

Gates, Bill, 133 Gibbons, Jim, 17-18 Goldstein, Harvey, 232-3, 235, 257 Gonzalez-Benito, J., 128 Goodman, S. E., 51 government policies: India's IT and, 102, 111, 113; Ireland's IT and, 102, 111, 113-15; Israel and, 53-4, 63; overview, 229-31; recommendations on, 5, 355-7; Taiwan/Hsinchu region and, 193, 195-7. See also public venture capital; science parks Greater Cambridge Partnership, 134 Greycell Technologies, 110 Groupe Speciale Mobile. See GSM standard GSM standard: creation of, 173-4;

Garnsey, E., 125, 150

importance of, 162, 349, 356; incompatibility of cellular solutions and, 172–3; need for Pan-European digital standard, 173; no "national champion" with, 175, 186; reducing marketplace uncertainties with, 175–6; success of, 174–5, 186; wireless subscribers by country, 175f

Hauser, Hermann, 132, 134, 137, 138–9, 150 Hayden Stone, 25, 26 Hewlett-Packard, 14, 18, 165, 166 high-technology industry definition, 155t history of clusters: Cambridge high-tech cluster, 132-4; India/Ireland IT, 81-6; Israel's Silicon Wadi, 56-64; Scandinavia, 170-82; Taiwan, 195-200. See also Silicon Valley Ho, C. S., 204 Hoff, Ted, 29 Holbrook, Daniel, 22, 24 Honors Cooperative Program, Stanford, 17 Hook, Robert, 132 Hopper, Andy, 133, 137, 150 horizontal relationships: India's IT and, 80, 81; Ireland's IT and, 80, 81; of Israel's Silicon Wadi, 65-6 Horvath, Michael, 248 Hsinchu Science Park, 195, 197, 198. See also Taiwan/Hsinchu region Huggins, R., 122 human capital: Fairchild and, 14; of "followers," 78; Israel's Silicon Wadi and, 45-8, 56; Soviet immigrants in Israel, 47, 48, 51, 56, 60

IBM's Haifa Research Lab, 73n36 ICT: analysis of, 2; international comparisons in, 44t; primary competitors, 42. See also specific clusters IDA, 115 IIT Madras, 107 immigrants/immigration: engineer returnees to China. 224, 226; knowledge

Human Genome project, 133

immigrants/immigration: engineer returnees to China, 224, 226; knowledge transfer/returnees and, 198–9, 198f, 210, 224, 226, 345–6; managerial labor/returnees and, 345–6; Soviet immigrants in Israel, 47, 48, 51, 56, 60; Taiwan/returnees and, 198–9, 198f, 210 incubator program: in Cambridge area, 134; description of, 286; in Israel, 63–4, 68; Scandinavia and, 164

India's IT: agglomeration economies and, 103–4; benefits from large firms, 110–11; composition of development services, 92t; as first-tier contractors, 94–5; government policies and, 102, 111, 113; historical overview, 81–6, 83t, 84t, 85t; human capital exportation and, 107; innovation and, 79, 81; international linkages, 106–7, 110; labor costs of, 100, 101; location of, 104; low-level activities and, 79, 93, 94, 97, 170; market of, 79, 84; MNCs and, 87, 96, 97; outflow of professionals and, 101; overview, 78–81, 115–16; product-oriented firms of, 92–3;



More information

Index 363

R&D investments of, 84-5; relocation pressures on, 80; representative firms, 89-90t; service-oriented firms of, 93, 94–5; Silicon Valley model and, 79, 86–7; skilled labor and, 98-9, 100, 101-2; software industry association (NASSCOM), 102; statistics on, 81-6, 83t, 84t, 85t; U.S. and, 79, 84; venture capital and, 109-10; vertical/horizontal externalities of, 104; visibility of, 102-3; weak industrial base and, 101-2 Industrial Technology and Research Institute (ITRI/Taiwan), 193, 210, 219, information and communications technologies. See ICT Information Technology Association of America (ITAA), 98 Infosys, 94-5 initial public offering. See IPO process innovation: clusters and, 1; commercialization of, 19-25, 58; India's IT and, 79, 81; Ireland's IT and, 79, 81; managerial labor and, 14; patents as measure of, 252, 253t; processes partitions and, 342-3; St. John's Innovation Centre, 134; Taiwan and, 190, 194-5, 198, 200-2. See also NSI; SBIR; venture capital Institute for Defense Analyses, 23 Intel: focus on R&D, 32; internal technology transfer, 21; Israel's Silicon Wadi and, 42, 47, 53, 67, 74; microprocessor applications, 30; minimum information and, 20; spinning off complementors, 34-5. See also Silicon Valley intellectual property: AT&T sharing of, 24; of Israel military, 49; Massana and, 92; Peregrine Systems Ltd. and, 95; trading of, 29 internal rate of return (IRR), 288 International Association of Science Parks,

113-15; historical overview, 81-6, 83t, 85t, 86t; innovation and, 79, 81; international linkages, 106-7, 110; labor costs of, 100-1; location factors of, 105t; low-level activities and, 79, 93, 94, 97, 170; MNCs and, 84, 87, 96-7, 111, 114; overview, 78-81, 115-16; productoriented firms of, 90, 92, 93; R&D investments of, 85-6, 86t; relocation pressures on, 80; representative firms, 88-90t; service-oriented firms of, 93-4, 95; Silicon Valley model and, 79, 86-7; skilled labor and, 98, 99-102, 114; specialization of firms, 91t; statistics on, 81-6, 83t, 85t, 86t; venture capital and, 109-10; vertical/horizontal externalities of, 104; visibility of, 102-3; weak industrial base and, 101-2 IRR (internal rate of return), 288 Israel Aircraft Industries, 50 Israel Institute of Technology (Technion), Israel's Silicon Wadi: biotechnology and,

50, 75; conflict with Palestinians and, 74: customer orientation and, 55, 62, 71, 72, 72n33; disadvantages/weaknesses of, 53, 55-6; factor endowments of, 44-55; firm distribution by type, 69f; focus of, 55-6; foreign acquisitions/ownerships of firms, 42, 47, 53, 62; future prospects, 74-5; government cost-reducing programs of, 53-4; high tech wages, 54-5, 55t; ICT description, 42; ICT employment statistics, 42, 43t; ICT export statistics, 42, 43t; locations of, 40-2, 41f; map of, 41f; "military personnel" firms in, 48t; overseas links and, 66; patents of, 59, 59f; ranking of, 40; software products and, 42, 57-8, 69, 71; Soviet Union immigrants and, 47, 48, 50-1, 56, 60, 63; specialized economic institutions of, 68-9; startups of, 42; university research of, 50, 68; yearly costs of ICT employee, 55t; young firms by type, 71f. See also military

Israel's Silicon Wadi cluster characteristics: industry composition, 69–71, 69f, 70f, 71f; intermediaries/institutions, 68–9; knowledge and, 66–8; location decisions, 72–4; networks (person-to-person), 65–6

Israel's Silicon Wadi cluster formation: cumulative (endogenous) forces and, 59-60, 65-6; exogenous forces and, 59, 60-5; history of, 57-8; overview, 56; transition to a cluster, 58-9

229, 232

328

Iobox, 164

Ionica, 140

international trade theory, 43–5 Internet boom: ICT expansion and, 4,

Silicon Wadi and, 62-3, 64f

336; Israel's Silicon Wadi and, 60,

61-3; venture capital and, 296-7, 296f,

IPO process: description, 289-90; Israel's

and, 103-4; benefits from large firms, 110-11, 112t; EU market of, 79, 84, 114;

Ireland's IT: agglomeration economies

government policies and, 102, 111,

More information

364 Index

Israel's Silicon Wadi comparative advantages: government policies and, 53–5; group attachments/collectivism and, 52–3; human capital and, 45–8, 56; ICT area knowledge, 48–51, 56; infrastructure of, 45; organizational skills in, 51–3

Israel-U.S. Binational Industrial Research and Development Foundation (BIRD), 56, 68

ITRI (Industrial Technology and Research Institute/Taiwan), 193, 210, 219, 222

Jaffe, Adam, 231, 265, 275 Jewish immigrants, 47 Jobs, Steve, 30 Jordan, David Starr, 9 Jowitt, Anthony, 233

Kallasvuo, Olli-Pekka, 178 Kaplan, Gadi, 45 Karnataka promotion of IT, 113 Keeble, D., 133, 136, 150 Kelley, Maryellen, 236 Kindle Banking Systems, 111, 112t Kista Science Park, 164, 165-6 Kleiner, Eugene, 25 knowledge transfer: Cambridge cluster and, 147-51, 148t; clustering theories and, 1, 341, 342, 351; internal transfer, 20-1; Israel's Silicon Wadi and, 48-51, 66–8; returnees and, 198–9, 198f, 210, 224, 226, 345-6 KPMG and India, 96 Krugman, P., 114 Kulicke & Soffa, 67 Kuo, Wen-Jeng, 203 Kurtz, D., 52 Kurz, Peter, 206

L&T Infotech, 93 labor (skilled): importance of, 97, 98–102, 343–4; India's IT and, 98–9, 100, 101–2; Ireland's IT and, 98, 99–102; Israel's organizational skills, 51–3; Soviet immigrants as, 47, 48, 51, 56, 60, 344; ways of achieving, 344. See also education; military (Israel); research; universities

labor costs: comparison by country, 100t; of India's IT, 100, 101; of Ireland's IT, 100–1 labor-intensive activities, 71 land limits and clusters, 139, 153, 353, 355 large firms: Cambridge's lack of, 122, 127–8, 153; importance of, 110–11, 112t, 167–8; India's IT and, 110–11; Ireland's IT and, 110–11, 112t; startups and, 33–5, 110; of Taiwan/Hsinchu region, 202–3, 204, 213

latecomers to IT: benefits of, 109; disadvantages of, 79-80, 86-7, 109 - 10Lavi aircraft project dismantling, 60 Law for the Encouragement of Capital Investment (Israel), 54n16 Lawson, C., 150, 155 Lecuyer, Christophe, 23 Lee, David, 205 Lee, John, 132, 150 Lerner, Joshua, 235 lessons learned: on commercial science, 19-25; importance of luck, 35-8; on opportunities, 25-31; scientists as managers, 10-19; spin-offs/competition, 31 - 5Levy, Brian, 203 Lewis, W. Arthur, 101 Lewis developmental model, 101 licensing business: ARM as example of, 140; avoiding competition and, 142; problems with, 141 limited partnership, 287-9 liquidation description, 289 localization services: of India's IT, 79; of Ireland's IT, 79, 93 localized decentralization: advantages of, 216-18; competition and, 218; preventing fragmentation, 217 Lockheed, 18 loyalty to firm: Israel's Silicon Wadi, 52-3; Silicon Valley, 52-3 Lucent, 42, 50 luck: importance of, 338; Silicon Valley and, 35-8 Luger, Michael, 232-3, 235, 257 Lumme, A., 133 Lynch, Mike, 141

Magnet program (Israel), 64–5n25, 68 managerial labor: importance of, 184, 344–5; innovation and, 14; internal technology transfer and, 20-1; return of expatriates as, 345-6; scientists as, 10-15, 345; Silicon Valley and, 10-15, 345; sources of, 345-6 manufacturing equipment and Intel, 32 Manuson, 93-4 Marconi, 134 marketing externality: as cluster characteristic, 58; of Israel's Silicon Wadi, 58, 62-3. See also visibility market/market access: Cambridge's local market, 144-5, 145t; connection models, 348-9; of Ericsson, 160-1, 179; of India's IT, 79, 84; of Ireland's IT, 79, 84, 114; of Israel's Silicon Wadi, 55-6, 62, 71; Israel's Silicon Wadi shortcut to, 62; of



More information

Index 365

Nokia, 160-1, 179; overview, 348-50; of Scandinavia, 160-1, 163, 171 Markley, Deborah, 235 Marshall, Alfred, 231, 341 Marshallian agglomeration economies. See agglomeration economies Marshallian externalities. See externalities Massana, 92 McHone, W. Warren, 234, 235 medical research center (MRC), Cambridge, 133 Memco, 74 mergers: acquisition or merger, 289; description of, 289; removing impediments to, 59 Merlin Ventures, 132 microprocessor applications, 29-30 Microsoft: Cambridge firms and, 132; Israel and, 74; Scandinavia and. military (Israel): engineering/science careers and, 47; group attachments/collectivism and, 52-3; handling of intellectual property of, 49; ICT R&D of, 48-50, 57, 58; organization skills acquired in, 51-2; person-to-person networks and, 65-6; research applications by, 49-50, 58 military contracts/spending (U.S.): commercial orientation and, 22-5; employment changes related to, 243; Fairchild and, 21, 22, 23, 24; "good enough" concept and, 22, 24; integrated circuit and, 23, 28; university research and, 16 military technology: (Israel) ICT R&D, 48-50, 57, 58; (Israel) research applications by, 49-50, 58; (U.S.) commercial orientation and, 22-5; (U.S.) Fairchild and, 21, 22, 23, 24; (U.S.) integrated circuit and, 23, 28; (U.S.)

applications 69, 49–30, 36, (U.S.) commercial orientation and, 22–5; (U.S.) Fairchild and, 21, 22, 23, 24; (U.S.) integrated circuit and, 23, 28; (U.S.) university research and, 16 "minimum information" principle, 20 Minuteman I/II, 21 Mlavsky, A. I., 63 MMRM computer center (Israel), 57–8 MNCs: description/examples of, 87, 96–7; India's IT and, 87, 96, 97; Ireland's IT and, 84, 87, 96–7, 111, 114; Scandinavia and, 163, 167, 168t; spillovers from, 111; Taiwan and, 195, 209 Monte Jade Science and Technology Association, 219

Association, 219 Moore, Gordon, 80, 335, 337, 338

Moore's Law, 7n MOS (metal-oxide semiconductors): Fairchild and, 21; Intel and, 35 Motorola: India and, 96; Israel and, 58, 73n36; military research and, 22; mobile telephony and, 177, 179, 180 multinational corporations. See MNCs

NASDAO: Cambridge industry listings,

140; Israeli firms on, 63 NASSCOM, 102 "national champions": GSM standard and, 175, 186; Israel's Silicon Wadi and, 74; Taiwan's government policies and, 196–7

National Science Council (Taiwan), 197, 219

National Semiconductor, 67, 73n36 national system of innovation. See NSI National Venture Capital Association, 291 NEG: clusters and, 339–41; equilibrium models and, 339, 340, 341

networks (person-to-person) and Israel, 65-6, 68

new economic geography. See NEG

new economy: description of, 333; working with old economy, 333–4, 338–9, 357
Nokia: cluster description/statistics, 163–4, 166–7; focus of, 162–3, 166–7, 176, 177–8, 179; global market of, 160–1, 179; transformation/success of, 177–8, 179.

See also Scandinavia

Noll, Roger, 252 noncompetitive clause, 49 Norman, Bob, 29 Novell, 96 Noyce, Bob, 12, 20, 27, 28, 36 NSI: clusters and, 339, 341–3; innovation processes partitions and, 342–3 Nurkse, Nagnar, 103

old economy: description of, 333; working with new economy, 333–4, 338–9, 357 Ollila, Jorma, 178 Olson, Mancur, 151 opportunities: followers and, 78–9; Silicon Valley and, 25–31, 36, 37; venture capital and, 36 Oracle, 95, 96 organizational skills and Israel, 51–3 Oslo Peace accords, 60 "out of town": advantages/disadvantages of, 349–50; Scandinavia and, 161–2, 163 outsourcing: to India/Ireland, 94, 96, 102; by Israel, 55

patents: in Israel's Silicon Wadi, 59, 59f; as measure of innovation, 252, 253t; of Taiwan, 194, 194t, 211; for trading intellectual property, 29; universities and, 231; U.S. regional counts of, 253t



> 366 Index

PCs: realizing applications for, 30; Taiwan's industry decentralization, 204-9; Taiwan's ODM, 206-7; Taiwan's OEM contracts, 205, 206-7, 207t, 208t Pearce, R. D., 97 Peregrine Systems Ltd. (Ireland), 95 personnel management: Fairfield and, 13; at Shockley Semiconductor, 10-11 planar technology, 21, 35 Porter, M. E., 67, 341 Powers, Tom, 177 price lowering and demand, 28, 30-1 product-oriented firms: description/examples of, 87, 90, 92-3; of India's IT, 92-3; of Ireland's IT, 90, 92, profitable stage definition, 294 protectionism, 355, 356 public policies. See government policies public venture capital: choosing investments for, 235-6; knowledge on effectiveness, 236; overview, 229, 230-1, 235-7. See also SBIR Program; science parks/SBIR effectiveness study

Qume, 205 R&D: Cambridge cluster and, 128, 130, 131, 142; India's investments in, 84-5; Intel's focus on, 32; Ireland's investments in, 85-6, 86t; Israeli location decisions and, 72-4; of Israeli military, 48-50, 67; Israel's advantages in, 48-51, 67; marketing and, 23; relationship to whole firm, 20-1; Taiwan and, 211; university funding of, 252, 254t, 255 Rafael, 50 Ramco, 92-3 Red Herring, 58, 164 reengineering services, 94 regional cluster, 2. See also clusters regional economy: Cambridge cluster and, 122–3; clustering theories, 339, 342; externalities and, 341; Silicon Valley and, rents and NEG, 339, 340 reputation effect: as cluster characteristic, 58; of Israel's Silicon Wadi, 58, 62-3. See also visibility research: of Cambridge cluster, 133-4; industrial experimentation, 22; Israeli military research, 48-50; progression of

returnees importance: to China, 224, 226; as managerial labor, 345-6; to Taiwan/Hsinchu region, 198-9, 198f, 210 Rheem Semiconductor, 12 Richards, John, 349 risk taking: of fixed-fee contracts, 95; of Scandinavia strategy, 182–3; in Silicon Valley, 37-8; startups and, 31-2 Rock, Arthur, 25, 26, 36 Royal Institute of Technology/ICT university, 165-6 RSA algorithm, 50 Rubin, Julia, 235 Sanger Research Centre, 133, 134 Santa Clara County economics, 15 Sasken, 95 Saxenian, AnnaLee: Cambridge firms/Britain, 139, 150, 153; externalities, 65, 139, 231, 265, 341; weak industrial base, 101 SBIR Program: crowding out private VC by, 236, 276, 277; description of, 230, 236; DoD SBIR funds, 252; funding of, 237f; geography of, 250, 252. See also science parks/SBIR effectiveness study scale economies and NEG, 339 Scandinavia: ancillary services/capabilities, 183; cluster description/statistics, 163-7, 165f; early entry of, 179, 180-1; Finland vs. Sweden, 166-7; focus on new technology, 162-3, 170, 171, 172, 176-82, 182-3, 185-6; growing/strategy of the cluster, 170-1; GSM standard, 162, 172-6, 186; importance of being global, 180, 181; joint ventures with, 165, 166, 167, 168t; local demand/new technology and, 171, 172, 182, 184-5, 186-7; market of, 160-1, 163, 171; MNCs and, 163, 167, 168t; overview, 160-3, 185-7; public policy and, 162; similarities to other clusters, 161-2; strategy of, 182-3; universities and, 165-6; variations from other clusters, 162-3; WAP and, 176, 180-2; wireless technology growth, 170-1; wireless technology standards and, 162, 172-6, 180-2, 184-5, 186. See also Ericsson; Nokia Schocken, Simon, 61 science parks: appearance of success, 234; cost-benefit analyses and, 234, 257; local economy and, 233, 235; need for internal/external linkages, 235; overview, 229-30, 231; primary objectives of, 232;

public subsidies for, 232-3; research on

233f

success of, 234-5; U.S. growth/number of,

new sciences, 24n8; pure science vs.

research (Israel), 50, 68. See also

Research Triangle Park (RTP), 233

universities

engineering, 13-14, 19, 22; university



More information

Index 367

science parks/SBIR effectiveness study: Computer/Office Equipment top counties, 243, 244t; Computer Programming/Data Processing/ Computer Services employment, 246, 247t; data sources, 238-9, 246, 248; Electronic Components/Accessories employment, 243, 245t; high-tech employment, 240, 241-2t, 243, 244-5t, 246, 247t; high-tech industries in, 239t; patents and, 252, 253t; SBIR approach/ results, 268-9, 270-1t, 272-3f, 274-6, 274t, 276, 277; SBIR funding, 237f; SBIR top regions, 250, 251t, 252; science parks approach/results, 257, 258-9t, 260, 261-3t, 264f, 265-8, 267t, 276-7; summary from data, 255-7, 256f; technology industries definition, 238-9, 239t; top high-tech employment centers, 240, 241t; top high-tech nonmilitary employment centers, 240, 242t, 243; university R&D funding, 252, 254t, 255; U.S. science parks growth/numbers, 233f; venture capital data, 246, 248; venture capital top regions, 248, 249t, 250t scientists/engineers: concentrations by country, 46f; in Israel, 45-7; as managers, 10-15, 345 Scitex digital printing systems, 57 security products: of Ireland's Baltimore Technologies, 90; Israel's Silicon Wadi and, 61 Segal, Quince and Wicksteed study, 121, 125, 126, 132, 142 semiconductor industry: as industry of transplants, 15; Israeli military R&D and, 49-50, 61; memory and patenting 29; as new field, 19-20. See also Fairchild Semiconductor Corporation; Silicon Valley Semiconductor Industry Association, 33 service-oriented firms: description/ examples of, 87, 93-5; of India, 93, 94-5; of Ireland's IT, 93-4, 95 Shahar, L., 52 Shamir, Adi, 50 Shockley, Bill, 9, 10-11 Shockley Semiconductor: beginnings of, 10-11, 15, 18; military research and, 22;

Silicon Valley: balanced VC portfolio of, 284, 314, 327–8; "contingent moments" and, 9; early success factors summary, 337; failure and, 31; imitating, 3, 160; "inevitability" and, 9; Israeli firms in, 72-3; luck and, 35-8; myths about, 9-10; "recipe" for, 8-9; semiconductor development and, 8; spin-offs/ competition and, 31-5; transformations needed for, 7-8. See also Fairchild Semiconductor Corporation; Intel; venture capital analysis/Silicon Valley imitators Silicon Valley approach: commercial science, 19-25; nature of semiconductor industry and, 15-16, 17; opportunities and, 25-31, 36, 37; scientists as managers, 10-15; Stanford University's role in, 15 - 19"Silicon Valley effect," 26 Silicon Valley model: India's IT and, 79, 86-7; Ireland's IT and, 79, 86-7 Sinclair, Charles, 150 Sinclair Research, 149 Singh, S., 97 skilled labor. See labor (skilled) skills: organizational skills, 51-3. See also managerial labor small and medium-sized enterprises/ Taiwan, 196-7 Small Business Innovation Research Program. See SBIR Program SMEs of Taiwan/Hsinchu region, 196-7 Smith, Donald, 235 software firms/products: Israel's Silicon Wadi and, 42, 57–8, 69, 71; as labor intensive, 71, 78. See also India's IT; Ireland's IT software industry association (NASSCOM), 102 Sohl, S., 287 South Cambridgeshire: strengths of, 128, See also Cambridge cluster Soviet immigrants in Israel, 47, 48, 50-1, 56, 60, 63 space limits and clusters, 139, 153, 353, 355 space program (U.S.), 21 specialization: advantages of, 216-17; disadvantages of, 217; industrial clustering and, 231; regional specialization, 122 speech compression products, 93 spin-offs: actively spinning off complementors, 34-5; with Cambridge cluster, 125-7, 126t, 127t, 132, 133, 143-4; competition and, 31-5; from Fairchild,

12; with India's IT, 103-4; with Ireland's

semiconductor basic research and,

Silicon Automation Systems (Sasken),

Corporation Shwed, Gil, 61

silicon transistors, 11

19-20. See also Fairchild Semiconductor



More information

368 Index

spin-offs (cont.) IT, 103; MOS technology and, 21; patenting and, 29; product-oriented firms and, 87; "Silicon Valley effect," 26. See also startups Sprague Electric, 22 SQW study, 121, 125, 126, 132, 142 Srujana Technologies, 95 Standard Industrial Classifications, 238 Stanford Research Park, 233 Stanford University, 15-19 startups: from Acorn, 137; with Cambridge cluster, 125-7, 126t, 127t, 132, 133, 143-4; definition, 294; exploiting underutilized ideas by, 32; focus and, 31; of Israel's Silicon Wadi, 42; large firms and, 33-5, 110; risk and, 31-2; Scandinavia, 165, 165f. See also spin-offs St. John's, 149 St. John's Innovation Centre, 134 Stone, Richard, 47 success: agglomeration economies and, 103-4; balanced VC portfolio and, 284, 314, 327-8; imitation effects from, 103-4; international linkages and, 104, 106–10; MNCs/large firms and, 110-11, 112t; overview, 102-3; vertical/horizontal externalities and, 104; virtuous cycle of, 103 Sun Microsystems: Ireland and, 96; Scandinavia and, 166 supply: of specialized services (Israel), 68. See also labor (skilled) supply chain, 68 Sweden and R&D, 73n34 Swedish Institute of Computer Sciences, Swedish science parks, 234 Symantec, 96

Tai, Ken, 219, 220 Taiwan/Hsinchu region: annual sales, 200f; annual value of IT production, 225f; avoiding fragmentation, 217; China ties to, 222-4, 224f; clusters of, 195; competition within, 218; description of current system, 200-4; earthquake scare of, 190; emergence of, 195-9; foreign direct investment (FDI) to, 195, 209; geographical cluster pattern of, 200-1; government policies and, 193, 195-7; IC competition/partnerships, 212f; IC "foundry" model, 210-11; IC industry decentralization and, 209-12, 213f; IC industry structure, 202f; as imitators, 205, 206, 207, 213; indigenous producers/innovation and, 190, 194-5, 198, 200-2; initial low-cost labor

advantage, 192, 195, 198, 205, 209; institutions for information/training, 203; interfirm linkages in, 217-18; IT profitability of, 212, 213f, 214–15t; IT profitability/U.S. comparison, 214–15t; large firms of, 202-3, 204, 213; "learning by doing," 205-6, 215, 218; Marshallian externalities and, 203; MP3 players/ CD-R discs, 207-8; overseas IT production, 223f; overview, 190, 192-5; patents of, 194, 194t, 211; PC industry decentralization, 204-9; PC ODM and, 206-7; PC OEM and, 205, 206-7, 207t, 208t; returnees to, 198-9, 198f, 210; Silicon Valley connections with, 213, 215, 218-21; similarities to Silicon Valley, 193-4, 197, 199, 200-1; Singapore comparisons with, 204; SMEs of, 196-7; South Korea comparisons with, 203-4; speed/flexibility of, 201-2, 204, 206; statistics on, 190, 191f, 192–3, 192f, 193t; supply chain, 201f; universities and, 195-6, 196f, 197, 209; U.S. Chinese experts and, 196, 197; venture capital and, 197-8, 199, 199f, 219; vertical disintegration of, 202, 216-17; wireless phones and, 208f, 209 Taiwan Semiconductor Manufacturing Co. (TSMC), 202, 210, 212 Taiwan's Ministry of Economic Affairs (MOEA), 196 Talisma, 92 Tata Consultancy Services (India), 94-5, 96 Technion (Israel Institute of Technology), technology industry: difficulties in defining, 238-9, 239t; prediction/road map for, 33; pre-Silicon Valley examples of, 14; structuring/Silicon Valley, 13-14; university lab vs., 13-14. See also specific examples Tecnomen, 164 Telia, 161 Terman, Fred, 9, 16, 17, 18 Teubal, M., 62 Texas Instruments, 96 "thin-client" problem, 180 Tishler, A., 50 trade secrets misappropriation, 12 transnational communities, 220-1 Trellis Photonics, 50 Trinity College Dublin (TCD), 90, 149 TSMC (Taiwan Semiconductor Manufacturing Co.), 202, 210, 212 turnover rate: in India ICT, 53n12; in Israel's Silicon Wadi, 52–3; in Silicon

Valley, 52-3



More information

Index 369

Unilever, 133 United Microelectronics Company (UMC/Taiwan), 202, 210, 212 universities: Cambridge cluster and, 148-9, 148t; Cambridge knowledge transfer, 147-9, 148t; Cold War and, 16; importance of, 231-2; industry links, 133-4; Israel's R&D/applications and, 50, 68; patents and, 231; R&D funding, 252, 254t, 255; Scandinavian ICT universities, 165-6; Taiwan/Hsinchu region and, 195-6, 196f, 197, 209; U.S. high-technology clustering and, 16-17; U.S. R&D funding, 16, 252, 254t, 255. See also education; research University of Cambridge, 122, 131, 133-4, 147-9, 148t Upside, 58 urban/regional economics, 339 U.S.-based stock exchanges, 42, 63, 70f

Varga, Attila, 231 Varian, 18 venture capital: agglomeration of, 282, 326-7; association with new technologies, 285; balanced VC portfolio as success driver, 284, 314, 327-8; beginnings of, 36; Cambridge cluster and, 131, 132-3; Cambridge example firms, 132; definition of, 285-6; economic policies and, 327, 329; enterprise formation and, 290-1, 290f; examples of venture-financed firms, 285; Fairchild and, 25-6, 31; following opportunities by, 36; home bias of, 282, 284, 327; importance of, 231; India/Ireland IT and, 108, 109-10; Israel's Silicon Wadi and, 42, 60, 63-4 64f; life cycle of business and, 290f, 303t, 304-5, 321t, 322; recession and, 284, 325-6; Scandinavia and, 163, 183; Silicon Valley and, 25-6, 31, 36; software production and, 108-9; statistics on, 107-8; structure of venture-financed firms, 287-90; Taiwan and, 197-8, 199, 199f, 219; time scale of formation, 328. See also public venture capital venture capital analysis/Silicon Valley imitators: categories of variables, 292, 293t; convergence, 316-17, 326-7; data analyses comments, 283-4; data used, 281, 292; firm development stage, 290f,

296f, 328; industry mix, 305, 306–8t, 309-10, 319, 320t; MAD statistic used, 317; overview, 280-5; power law relationship/regional activity, 301; recent data, 322, 323-4t, 325-6; regional activity breakdowns, 297, 298-9t, 300-1; regions used, 292, 293t, 294; Silicon Valley/ regional comparisons, 317, 318f, 319, 320t, 321t, 322; Silicon Valley's balanced VC portfolio, 284, 314, 327–8; Silicon Valley subregions, 300–1, 300t; software firms, 309-10, 328; summary/conclusions, 326-30; technology/nontechnology firms, 301, 302t, 304, 319, 320t, 322; unit of observation in, 292; U.S. comparisons, 295f; VC firms as VC source, 310, 311f, 312, 313t, 314, 315t; VC firms/startups co-location, 310, 312, 313t, 314 vertical competition, 169 vertical disintegration: of Cambridge industries, 137; of semiconductor firms, 35-6; of Taiwan's IT, 202, 216-17 virtuous cycle: Cambridge cluster and, 133; defining starting point of, 333; description of, 103, 231; established clusters and, 1-2; of success, 103 Vishesh Infosystems (India), 92-3 visibility: of Cambridge cluster, 132, 134, 140; of India/Ireland IT industry, 102-3. See also marketing externality Vocalis (Cambridge), 141, 142

wadi definition, 42 Wallsten, Scott, 355 WAP. See Wireless Access Protocol weak industrial base: effects of, 101; of India/Ireland, 101-2 Weizmann Institute (Israel), 46, 50 Wetzel, W., 287 Wilkes, Maurice, 150 Wipro, 94-5 Wired, 40, 164 Wireless Access Protocol (WAP): multiple standards and, 180; Scandinavia and, 176, 180, 181, 182; standard acceptance, 180-2; standard creation, 180 wireless products/technologies: Israel and, 48-9, 58; subscribers by country, 175f. See also Scandinavia

Yossi Vardi, 67 Yozma, 63

294, 303t, 304-5, 321t, 322; growth,

295-7, 296f; growth and Internet, 296-7,