
Subject Index

- ACMS model of capital/labor substitution, 160, 161–66; variants of, 171–87
- Aggregation, in capital–labor substitution, xiii, 160, 187, 193, 194, 195–97, 208, 209–11
- Agriculture: in Belgium, 26; capital services in, 43–44; in Chile, 26; in Colombia, 88, 89, 94, 95, 97, 103, 105, 106, 107, 109, 144 n.11; in France, 26, 30; in Germany, 26, 30; income in, 96–97; in Italy, 26; in Ivory Coast, 22, 26, 29; in Kenya, 22, 26; labor in, 17, 20–21, 22–26, 40, 43–44; protected, 86, 94, 106, 109; in South Korea, 22, 29, 30; in Taiwan, 29; in Tunisia, 22, 30, 32; in Turkey, 26, 29; in Uruguay, 29, 31
- Alcohol, 18
- Balance of payments, 88; constraints on, 32
- Belgium: agriculture in, 26; manufacturing in, 26, 31; optimal trade model in, 16, 26
- Brazil: coffee in, 149, 151, 154; export promotion in, xii, 149–57; gross domestic product in, 154, 156, 157; influence on world prices of, 151; manufacturing in, 154, 156; multinationals in, 251; real exchange rate in, 152–53, 154, 156; technology in, 251
- Capital: cost of, 12, 37, 144 n.7, 187, 227–29; human, xiii, 90, 91, 193, 194; physical, xiii, 17, 193, 194, 227, 239–43; as production input, 4, 7–8, 12, 15, 20, 21, 86–87, 162, 215, 221, 228; rate of return on, 86–87, 162, 171, 221; services, 34–38, 43, 48, 80; shifts, 34, 38; stock/flow measures of, 8, 21, 229; and skill, 208, 209. *See also* Capital intensity; Capital/labor substitution
- Capital intensity, xii, 86, 145 n.18, 218, 219, 220, 222–29; in Colombia, 88; and cost of capital, 227–29; in developing countries, 37–38, 216–21; and labor costs, 227–53; measures of, 197–98, 211 n.8, 222, 228–29, 233, 239–43, 253; in manufacturing, 222–26; of multinationals, xiii, 215, 222–26; and protection, 98, 108, 110; studies of, 249–52; in Sweden, 225, 230–33, 243–49, 252–53; and technology, 249–52; in United States, 223, 230–33, 237–43, 252–53
- Capital/labor ratios, 34–38, 80, 81, 237–43
- Capital/labor substitution, xi, xii, 2, 41, 159–211; ACMS model of, 160, 161–66, 171–87; aggregation in, xiii, 160, 187, 193, 194, 195–97, 208, 209–11; in Chile, xiii, 37, 38–40; cross-country estimates of, 159, 160–61, 164, 165, 166–71, 180–86; in developing countries, 34–38, 81; effects of, 159–60; exchange rates in, 182; GDP per capita in, 178, 179, 180; GNP per capita in, 185–86; and income, 159, 182–83; inflation and, 182; life expectancy and, 167, 180–81; model for, 161–87; by multinationals, 216–18, 219, 230, 232–33, 251; quality of labor in, 171, 176, 180, 181; returns to scale in, 175–76, 177; technology in, 176, 178, 179, 186, 187, 208–9;

- Capital/labor substitution (*cont.*)
 and trade policies, 37–38, 159, 181–82;
 translog production function in, 161, 194,
 195–97, 199, 209; value of, 186–87
- Chile: agriculture in, 26; capital in, xiii, 34;
 capital/labor substitution in, xiii, 37, 38–
 40; census in, 197; export growth in, 2, 32,
 HOS goods in, 38; import substitution in,
 26, 34; labor force in, xiii, 20, 26, 27,
 38–40, 43, 44, 194, 198, 208; manufactur-
 ing in, 26, 197, 199, 208; mining in, 34;
 NRB industries in, 26, 31, 38, 41; optimal
 trade model in, 16, 17, 20, 26, 27, 29, 30,
 31, 32, 34, 37, 38–40; skilled vs. unskilled
 labor in, 38–40, 43; tariff rates in, 41;
 trade strategies in, 2, 32, 41
- Cobb-Douglas production function, xii,
 xiii, 2, 4, 12, 16, 21–22, 48, 79, 175, 186,
 187, 195, 199, 208, 209
- Coffee: in Brazil, 149, 151, 154; in Co-
 lombia, 87, 94, 144 n.13
- Colombia, 83–110; agriculture in, 88, 89,
 94, 95, 97, 103, 105, 106, 107, 109, 144
 n.11; census in, 84, 89–90, 93, 94–95; cof-
 fee in, 87, 94, 144 n.13; DANE survey in,
 89, 93, 94, 96; export promotion in, 88,
 89; GNP in, 88, import control in, 85, 88;
 imports in, 106–7; import substitution in,
 88, 108, income in, xi, 89, 93, 94–95, 97–
 98, 106–7, 144 n.14; manufacturing in, 84,
 88, 89, 93, 95, 96, 106; protection in, 84,
 85, 86–87, 88, 108, 110; refining in, 93–94,
 100, 103, 105; self-employed in, 97–98,
 144 n.15, 145 n.20, 145 n.21; trade poli-
 cies in, 84, 85, 86–89, 106–8, 110
- Consumption, domestic, 5–6, 150–51
- Corden index of effective protection, 85,
 88–89, 96, 100, 143 n.1
- Deflator, common price, 176, 177
- Devaluations, 149, 152, 154, 157
- Distortions: commodity and factor market,
 x–xi, xiv, 1, 14, 29–31, 37, 84; costs of, xiv,
 14, 21, 29–31
- Duty. *See* Protection
- Employment, ix, x, xiv, 83, 215. *See also*
 Labor
- Equilibrium, conditions of, 2, 11–13, 15, 16,
 85, 143 n.2
- Exchange rates, x, xii, 3, 88; black market,
 167, 182, 189 n.7; in Brazil, 152–53, 154,
 156; in Colombia, 88; effective, 154; and
 export expansion, 152–53, 154, 156; free
 market, 189 n.7; official, 167, 182, 189
 n.7; real, 151, 152–53, 154, 156; sliding
 peg, xii, 88
- Experience, and income, 89–91, 100, 103,
 109
- Export promotion, ix, xi, xii, xiii; in Brazil,
 xii, 149–57; in Chile, 2, 32; in Colombia,
 88, 89; devaluations in, 149, 152, 154,
 157; and exchange rate 152–53, 154, 156;
 incentive in, xii, 149, 152, 154, 157; and
 income, 153–54; in Indonesia, 32–34; in-
 dustries and, xi, xiii, 40, 208, 209; in
 South Korea, 32; in Taiwan, 32; in Tuni-
 sia, 32
- Export supply functions, 150–54
- France: agriculture in, 26, 30; manufactur-
 ing in, 26, 31; optimal trade model in, 16,
 26
- GDP. *See* Product, gross domestic
- Germany: agriculture in, 26, 30; manufactur-
 ing in, 22, 31; optimal trade model in,
 16, 22, 28
- GNP. *See* Product, gross national
- Goods: home, 3–6, 7, 10, 11, 12, 13, 16, 17,
 22, 26–27, 37, 40, 42–43, 48, 79–80, inter-
 national (traded), 3–6, 7–9, 11, 12, 16, 17,
 18, 19, 26–27, 37, 42–43, 48, 79–80, 149.
See also Industries; Production
- Harrod-Domar model, 160
- Heckscher-Ohlin-Samuelson (HOS) model
 of trade theory, ix, 3, 18, 19, 84
- Heteroskedasticity, 92, 93, 199
- Horsepower per worker, 96, 145 n.18. *See*
also Production
- Imports, world, 151, 152, 154, 156
- Import substitution, ix, xi, xii, xiii, 37, 40,
 86; advantages of, 32–34; in Brazil, xii; in
 Chile, 26, 34; in Colombia, 88, 108; in-
 dustries of, xiii, 208, 209; in Kenya, 26; in
 South Korea, 40; in Taiwan, 40; in Tuni-
 sia, 40; in Turkey, 26, 31
- Incentives, x, xi, xii; in Brazil, 149–57; in
 Colombia, 85–87, 93–94, 97, 98. *See also*
 Exchange rates; Export promotion; Im-
 port substitution; Protection
- Income: agricultural, 96–97; and capital/
 labor substitution, 159, 182–83; in Co-

- lombia, xi, 89, 93, 94–95, 97–98, 106–7, 144 n.14; and experience, 89–91, 100, 103, 109; and exports, 153–54; generating function model, 89–105; and imports, 106–7; in manufacturing, 96–97; non-monetary, 96; per capita, xii; and protection, xi–xii, 84–85, 87, 90–91, 95–97, 98, 99, 100–105, 106, 109; rural vs. urban, 96–97; and schooling, 89–91, 96, 100, 103, 108, 109; and trade strategy, ix; wages as, 167
- Indonesia, 44–45; capital/labor substitution in, 37; export growth in, 32–34; labor in, 26, 27, 37; manufacturing in, 22, 34; optimal trade model in, 16, 18, 22, 26, 27, 29, 31, 32, 34, 37; refining in, 31
- Industries: capital-intensive, x, 96, 108–10, 179, 218, 219, 220, 222–26; categorized, 17, 47–48; export-producing, xi, xiii, 40, 208, 209; HOS-based, 18, 40, 47–48; import-competing, xiii, 208, 209; labor-intensive, ix, xiv, 89, 108, 180, 218, 219, 220, 222, 225, 231, 232–33, 246, 247, 251, 252; natural resource based, 3, 17, 18, 26, 40, 47–48; skill-intensive, 89
- Inflation, 167, 182
- Italy: agriculture in, 26; manufacturing in, 26, 31; optimal trade model in, 16, 26
- Ivory Coast, 45; agriculture in, 22, 26, 29; capital/labor substitution in, 37, 38; home goods in, 22, 26; labor in, 26, 27, 37, 38; manufacturing in, 22, 29; optimal trade model in, 16, 19, 20, 22, 26, 27, 29, 31, 38; petroleum in, 31; tariff rates in, 41
- Kenya, 45; agriculture in, 22, 26; capital in, 34; capital/labor substitution in, 37; home goods in, 22, 37; import substitution in, 26; manufacturing in, 22, 26, 34; optimal trade model in, 16, 19, 22, 26, 28, 34, 37
- Kuhn-Tucker conditions, 2, 9–11, 15
- Labor, 84; agricultural, 17, 20–21, 22–26, 40, 43–44; in Chile, xii, 20, 26, 27, 38–40, 43, 44, 194, 198, 208; cost of, 163, 165, 187, 215, 220, 225, 227–29, 230–36, 238–39, 243–49, 252–53, 254 n.3; income measured, 89–93, 96; in Indonesia, 26, 27, 37; in Ivory Coast, 26, 27, 37, 38; in Kenya, 26, 37; in manufacturing, 22–27; market distortions in, xiii, 41, 106; in multinationals, xiv, 215, 225–53; as production input, 4, 7, 12, 17, 20, 21, 27, 34–38, 42–43, 48, 80, 86–87, 89, 90–91, 162, 215; and protection, 86, 143 n.4, 159; quality of, 164–65, 171, 176, 180–81, 193, 227–28, 229, 233, 238; service shifts, 22–27; skilled, xiii, 4–5, 14, 15, 16, 20–21, 39, 40, 44, 193, 208, 209, 229, 246, 247–49; skill of, 193, 209, 229, 247–49; in South Korea, 26, 27, 37, 38, 81; in Taiwan, 26, 27; in Tunisia, 20–21, 26, 38, 39, 43, 46; in Turkey, 26, 38, 39, 43; unskilled, xiii, 4–5, 14, 15, 16, 20–21, 144, 209, 215, 227; in Uruguay, 26, 27, 37. *See also* Capital/labor substitution
- Lagrange multiplier, 9, 11, 15. *See also* Prices, shadow
- Life expectancy, 167, 180–81
- Manufacturing: in Belgium, 26, 31; in Brazil, 154, 156; capital intensity in, 222–26; in Chile, 26, 197, 199, 208; in Colombia, 84, 88, 89, 93, 95, 96, 106; in developing countries, 22, 31, 34; in France, 26, 31; in Germany, 22, 31; income in, 96–97; in Indonesia, 22, 34; in Italy, 26, 31; in Ivory Coast, 22, 29; in Kenya, 22, 26, 34; labor in, 22–27; protection in, 88, 106, 109; in South Korea, 22, 31; in Sweden, 225, 230–33, 243–49; in Taiwan, 22, 31; in Tunisia, 22, 29, 30, 31, 32; in Turkey, 22, 26, 34; in the United States, 222–26, 230–32, 237–43; in Uruguay, 22, 34. *See also* Production
- Multinationals, xiii–xiv, 215–53; in Brazil, 251; and capital costs, 227–29; capital intensity of, xiii, 215, 222–26; capital/labor substitution in, 216–18, 219, 230, 232–33, 251; foreign affiliate operations of, 222–26; home operations of, 222–26; and labor, xiv, 215, 225–53; labor-intensity of, xiv, 215, 222, 225; in less developed countries, 249–52; in Sweden, xiii, 215, 230–33, 243–49, 252–53; in the United States, xiii, 215, 230–33, 251–53; and wages, 222, 244–45, 246, 247–49
- National Bureau of Economic Research project, ix, xiv, 83–84, 107
- Optimal trade model: applied, 16–40; described, 3–16; procedures in, 79–81; properties of, 41–43
- Ordinary least-squares estimates, 92, 151, 162, 163, 198–99

- Prices: Brazil's influence on, 151; and capital costs, 227; domestic, 19, 20, 30, 40, 41, 85; international, 3, 13, 19, 20, 27, 29, 30, 40, 44-45, 46, 47, 85, 151; shadow (efficiency), 2, 5, 11-13, 79, 81
- Product, gross domestic, 167; in Brazil, 154, 156, 157; per capita, 186, 187; per capita, in capital/labor substitution, 178, 179, 180; per capita, and labor costs, 227-28, 229, 230, 233
- Product, gross national, 88, 167; per capita, 185-86
- Production: capital as input of, 4, 7-8, 12, 15, 20, 21, 86-87, 162, 215, 221, 228; vs. consumption, 6; costs of, 86; domestic value added of, 2, 4, 13-14, 16, 21, 29, 96, 145 n.18; input-output studies of, 16-17, 19-22; international value added of, 1, 2, 5, 6-7, 8, 9, 11, 12, 13, 14, 15, 16, 27-29, 30, 79; labor as input of, 4, 7, 12, 17, 20, 21, 27, 34-38, 42-43, 48, 80, 86-87, 89, 90-91, 162, 215; structuring a model for, 3-16. *See also* Manufacturing; Protection
- Production function, 188 n.2, 219-21; Cobb-Douglas, xii, xiii, 2, 4, 12, 16, 21-22, 48, 79, 175, 186, 187, 195, 199, 208, 209; translogarithmic, 161, 194, 195-97, 199, 209
- Profit, 11, 12, 16; maximization, 161, 167, 171, 199
- Protection, xi, 1, 14, 18, 20, 37, 83-110, 143 n.3, 143 n.5, 148 n.5, 221, 227, 251, 253 n.1; on agriculture, 86, 94, 106, 109; and capital intensity, 98, 108, 110; in Colombia, 84, 85, 86-87, 88, 108, 109, 110; Corden index of, 85, 88-89, 96, 100, 143 n.1; defined, 85; domestic prices as, 29; distortions of, 83; effect of, 14, 83, 85-87, 109; on exports, xii, 94, 152; import controls as, 20, 80, 85-88; incentive effects of, x, xi, xii, 85-87, 93-94, 97, 98, 149-57; and income, xi-xii, 84-85, 87, 90-91, 95-97, 98, 99, 100-105, 106, 109; and labor, 86, 143 n.4, 159; in manufacturing, 88, 106, 109; and productivity, 83; quotas as, 85, 151; in refining, 94; and schooling, 98-100, 106; subsidies as, 11, 13, 16, 19, 85, 88, 152, 187, 221; tariffs as, 19-20, 41, 44, 45, 46, 47, 80, 85, 88
- Quasi rents, 84, 86, 87, 106, 108, 109, 110. *See also* Distortions; Protection
- Quotas. *See* Protection
- Returns to scale, 175-76, 177, 199, 208, 211 n.4; constant, xiii, 209, 211, 221
- Schooling: and income, 89-91, 96, 100, 103, 108, 109; and protection, 98-100, 106
- Skill. *See* Labor, skill of
- Slater constraint qualification, 10
- South Korea, 45, 252; agriculture in, 22, 29, 30; capital/labor substitution in, 37, 38, 81; food processing in, 34; import substitution in, 40; labor in 26, 27; manufacturing in, 22, 31; optimal trade model in, 16, 17, 18, 19, 20, 22, 26, 27, 28, 29, 30, 31, 32, 34, 37, 38, 40, 79; prices in, 41; textiles in, 18, 26, 30, 31, 34; trade policies in, 28-29, 32, 34
- Subsidies. *See* Protection
- Sweden: capital intensity in, 225, 230-33, 243-49, 252-53; Industriens Utredningsinstitut, 215, 221; labor costs in, 230-33, 243-49; manufacturing in, 225, 230-33, 243-49; multinationals in, xiii, 215, 230-33, 243-49, 252-53
- Taiwan, 45-46, 252; agriculture in, 29; capital/labor substitution in, 37, 38; goods in, 22, 26; labor in, 26, 27; manufacturing in, 22, 31; optimal trade model in, 16, 18, 19, 20, 22, 26, 27, 28, 29, 31, 32, 34, 38, 40; trade strategy in, 32
- Tariffs. *See* Protection
- Taxes, 11, 13, 16, 85. *See also* Protection
- Technology: in Brazil, 251; and capital intensity, 249-52; in capital/labor substitution, 176, 178, 179, 186, 187, 208-9; labor-intensive, 216; United States advantage in, 219
- Textiles, 17; in Ivory Coast, 26; in South Korea, 18, 26, 30, 31, 34; in Tunisia, 34; in Turkey, 26
- Tobacco, 18, 31
- Trade: free, 2, 28, 29; freer, 2, 27; HOS theory of, ix, 3, 18, 19, 84; optimal, model of, 16-40; strategies, ix-xiv, 1, 2, 5, 14, 30, 40, 83, 85, 171, 193. *See also* Export promotion; Import substitution; Protection
- Tunisia, 46; agriculture in, 22, 30, 32; capital/labor substitution in, 37, 38; import substitution in, 40; labor in, 20-21, 26, 38, 39, 43, 46; manufacturing in, 22, 29, 30, 31, 32; optimal trade model in, 16, 19,

- 20–21, 22, 29, 30, 31, 32, 34, 37, 38, 39, 40; textiles in, 34
- Turkey, 46–47; agriculture in, 26, 29; capital/labor substitution in, 37, 38; food processing in, 31, 34; import substitution in, 26, 31; labor in, 26, 38, 39, 43; manufacturing in, 22, 26, 34; optimal trade model in, 16, 18, 20, 22, 26, 27, 28, 31, 34, 37, 38, 39; State Economic Enterprises of, 20, 31, 46–47
- United States: Bureau of Economic Analysis, 215, 221; capital intensity in, 223, 230–33, 237–43, 252–53; capital/labor ratio in firms of, 237–43; labor costs in, 230–33, 238–39; manufacturing in, 222–26, 230–33, 237–43; multinationals in, xiii, 215, 230–33, 251–53
- Uruguay, 47; agriculture in, 29, 31; capital/labor substitution in, 37; labor in, 26, 27, 37; manufacturing in, 22, 34; meat processing in, 31; optimal trade model in, 16, 18, 19, 20, 22, 26, 27, 31, 34, 37; tariff rates in, 41
- Wage/rental ratios, xi, xii
- Wages: and capital intensity, 252–53; in capital/labor substitution, 182–83; in less developed countries, 219; and multinationals, 222, 244–45, 246, 247–49; rates of, xiii, 11, 12, 16, 20, 37, 84, 175, 227–29; real, 165–66; in Sweden, 244–45, 246, 247–49. *See also* Income; Labor