EJISDC (2003) 13, 3, 1-6

The New Software Exporting Nations: Impacts on National Well Being Resulting From Their Software Exporting Industries

Erran Carmel
American University, Washington D.C., USA
carmel@american.edu

ABSTRACT

"New software exporting nations" are those dozens of nations that have begun exporting software products and services in recent years. Much has been written about the remarkable success of India and there is excitement regarding the promise for other developing, emerging, and transition economies. We examine the impact on the broader national economies of a software export sector. Economic and social impacts include: impact on labor, impact on new organizational forms, stimulation of infrastructure and other industries, economic impacts, and political impacts. Governments intervene to stimulate the software exporting industry because they recognize that there is a potential for spillovers; and that domestic markets do not create sufficient stimulus.

1. INTRODUCTION

Dozens of nations - from Brazil to the Philippines - are now exporting software products and services. These are labeled the "new software exporting nations" (Carmel, 2003a, this volume). Almost all of these nations are not advanced economies, but rather, newly-industrialized economies, emerging economies, transition economies, or developing economies. Implicit in the excitement surrounding this phenomenon is the notion that these emerging software industries will positively impact these nations' well-being. This issue is of particular importance to policy-related research, for if the software exporting industry does *not* have broad impacts on national welfare then it is of no special consequence and should not merit the excitement that it has generated.

Thus, the concern of policy makers is not just the software exporting industry per se, but the greater national social and economic benefits that success in software will bring. Developing nations, in particular, see high technology growth as an opportunity to catch up to advanced nations and as a possible cure for uneven development – or dualism (dualism exists when there is a modern sector alongside a very poor sector with large wage differentials between the two: Krugman and Obstfeld (1994)).

We begin by presenting theory, primarily from international economics, of the expected national benefits. Then we present a preliminary discussion of these promised/expected benefits for the specific case of the software export industry.

2. THEORY OF NATIONAL WELFARE RESULTING FROM EXPORT INDUSTRIES

The software sector is important to national well-being, or "national welfare" (more so than, say, the toy industry) because this industry has multiplier effects that are greater than that of the industry in isolation. In many cases, software is seen as a strategic national industry that merits special national attention. Governments tend to focus policies to develop such industries. For example, the Taiwanese government established six criteria for strategic

industries that merit proactive government promotion: high linkages[1], high market potential, high tech intensity, high value added, and low pollution (Yang, 1993). It is important to emphasize though, that encouraging governments to choose such strategic industries is quite risky since a particular industry's success is almost impossible to predict in advance (Hausmann and Rodrik, 2002).

Governments intervene on behalf of a special industry for a number of compelling reasons. First, some vertical sectors can be powerful engines of national growth, because the growth is determined by factors that are exogenous to that nation's economy. In other words, the continued, large, global demand for software will foster increasing economies of scale and scope[2]. Second, governments intervene because of market failures. Market failures manifest differently in developing and developed nations. In developing nations it is the absence of markets that governments try to spur. In more advanced nations it is the imperfections in existing markets that governments attempt to remedy; imperfections such as externalities, incomplete information, monopolies, and risks. Krugman and Obstfeld (1994) argue that the main reason governments should intervene to support a vertical export industry is *externalities* - namely, the spillovers to firms outside of the immediate industry.

Thus, governments institute policies to encourage certain vertical industry development. These policies manifest in many forms: protectionism, import substitution, export promotion, export subsidies, preferential loans, local content requirements, management assistance, etc. Economists have examined whether these policies have a net positive impact. Using a theoretical model, Grossman and Helpman (1991) find that a "small dose of [government] growth enhancing commercial policy may […] improve aggregate welfare".

At some point, however, there are diminishing returns from national government policies. Government interventions such as subsidies (e.g., to the software industry) may continue to increase that vertical industry's growth, but at the expense of national welfare. There is considerable consensus among economists that industry *protection* (in the form of quotas, tariffs, etc.) has questionable effects on the industry in question and is probably less favourable to national welfare since it spurs the protected industry to inefficient behaviour, such as rent-seeking activities rather than innovative, competitive activities (Grossman and Helpman 1991).[3]

Export led growth has shown mixed results to date. In Reizman et al. (1996) only 30 of 126 nations showed causality between export-led growth to overall economic growth. Some of the success cases are the newly industrialized nations of Korea, Taiwan, Hong Kong, and Singapore where export-oriented policies led to GDP growth of about 5% per annum over many years. By the early 1990s, these four nations approached per capita incomes of developed nations (Wignaraja, 1999). Conversely, in the case of Sri Lanka, export-oriented sectors grew since the economic liberalization of the 1970s, but growth has been largely in less-sophisticated technologies, primarily apparel. There has been little industry investment in process-related R&D and there have been few local linkages - linkages in the form of local subcontracting (Wignaraja, 1999). These local linkages are those that are critical to increases in national welfare.

Finally, some fault these new software exporting nations for competing mainly on low wages of their labor. But Krugman and Obstfeld (1994) point to standard international

[1] The term *Linkage* is used here as economists use the term, meaning linking and influencing other firms and industries in the economy.

[2] There is some disagreement about whether a software industry specializing in services (as India does) provides economies of scale.

[3] An exception may be Brazil, which has shown a contraction in IT sector employment since protections were lifted (Tigre and Bothelo, 2001).

economic theory and argue that trade is beneficial to the low wage country - even when its only advantage is the relatively lower wages of its labor - because of the fallacy of unequal exchange.

3. IMPACTS OF THE NEW SOFTWARE EXPORTING INDUSTRIES

We look to India and other relatively new software exporting nations for an understanding of the economic and social impacts of this sector. Evidence of impacts is still tentative and often anecdotal. Examining the impacts of the still younger software industries in, say, Jordan or Costa Rica, is largely premature. The potential national impacts are summarized in Table 1 and then discussed further below.

The growth of the software export industry has direct benefits on labor within that sector through job creation (e.g., in Bulgaria, the software industry, much of it for export, employed 7,000 people in 2001). Wages of software professionals rise; for example in India wages went up 20% per year for many years. The owners of software equity increase their wealth: high tech millionaires were created in many nations in recent years.

The impact on labor migration is ambiguous: The industry's success can spur the loss of newly skilled and trained professionals (brain-drain) or it can retard emigration, attract repatriates (e.g., India) or attract new emigrants (e.g., Ireland) (Economist, 2002). The software industry growth also pushes up wages in other sectors of the economy.

The growth of the software export industry has direct and indirect benefits on the organizational forms and structures of the software firms themselves and those of other enterprises. Over time the software export industry adopts international business norms. Foremost among these are the international quality standards typified by the Capability Maturity Model (popular in the USA) or the international ISO 9000. The former standard was embraced early on in the Indian industry and, in recent years, has been emulated by other national industries (e.g., China, Pakistan, Russia). Other norms include international accounting standards, professional corporate governance, and (the more intangible) professional marketing and customer services standards.

The organizational form tends to be flatter in the software exporting industry and this form is emulated by other firms in the new software exporting nations. Additionally, professional human resource policies are instituted to screen, hire, train, advance, and retain labor. Thus, in sum, the culture of work is transformed. Arora et al. (2001) argue that perhaps the most important impact of the India's software export success is its indirect effect as an exemplar for new business organizational structures and forms that are relatively new to India. The Indian software firms have flat hierarchies, with young management teams, and with an emphasis on efficiency and punctuality. Indian software firms developed professional human resource practices in response to foreign clients who demanded launching large projects on short notice. In India other, non-software, industries are adopting the organizational styles of flat hierarchies, and employee participation in decision-making.

National Impacts of a Software Export Industry	Brief Comments
Impact on labor: ♦ Employment ♦ Wages ♦ Wealth ♦ Emigration, immigration, repatriation	Software export industry creates jobs. Wages of software professionals rise. Owners of software equity increase wealth. Similar indirect impacts on labor in other sectors. The impact on labor migration is ambiguous.
Impact on new organizational forms: ♦ Improve business forms and structures ♦ Professionalize Human Resource (HR) policies ♦ Raise standards/ change the culture of work ♦ Increase technological/innovative entrepreneurship	The software export industry adopts international business norms that have direct impacts on software firms and indirect impacts on other sectors. Organizational structures are flatter; professional HR practices are introduced to screen, hire, train, advance, and retain labor. Transformation of work culture toward attainment of high quality international standards of process and outputs.
Stimulate infrastructure and other industries ♦ Technology infrastructure ♦ Ancillary/support services ♦ Related industries ♦ Education and training ♦ Quality of Life	Indirect impacts: externalities. Externalities are spillovers and stimuli to other firms outside the immediate industry. Software demand spurs investment in communications infrastructure Related industries such as *IT-enabled services* are stimulated. Demand for software skills spurs investments in general education, higher education and specialized training institutes.
Economic impacts: ♦ Trade balance ♦ Currency ♦ GDP	Direct and indirect impacts: Software exports improve national trade balance, though currency strength may hurt other national sectors. Software exports contribute to GDP growth.
Political impacts: ♦ Reinforce moderate middle class ♦ Increase income inequality ♦ Political backlash	Indirect political impacts: enlarged middle class more likely to support democratic and pro-market policies; income inequality rises leading to possible political backlash.

Table 2: Direct and Indirect impacts on national welfare anticipated with growth of the software export sector.

Another type of structural change is the growth of a technocratic innovation and entrepreneurship model. This trend surfaced in Israel (Kenvin, 1996) and in India (Athreye &

Arora, 2002). We also see this phenomenon in other high-tech fields in the newly industrialized nations of East Asia.

The growth of the software export industry can stimulate other national entities. Economists label such impacts: *externalities*. Externalities are spillovers and stimuli to other firms outside the immediate industry. We discuss spillovers in communications infrastructure, ancillary services, related services, and education. The demand by the software industry helps spurs investment in internet and communications infrastructure which benefits wider sectors of business and society. Certainly this was the case in India in the mid 1990s. When the Internet took off, India suffered from poor connectivity which was ameliorated within just a few years. Additionally, the software industry spurs demand in services that supply the software industry (construction, accounting, hospitality, and legal). Even more significant is the input on related industries such *as IT-enabled services* (i.e., services, such as call centers, that rely on advanced infrastructure) such as those found in India, the Philippines, and some central and eastern European transition economies. These industries employ large numbers of workers in export-focused knowledge services. For example, in the Philippines, thousands are employed in call centers.

Demand for software skills spurs larger investments in general education, higher education and specialized training institutes. Athreye & Arora (2002) point out that the increasing wages in the Indian software industry induced greater investment in education and training by both the government and the private sector. The Indian government has expanded IT curricula in colleges nationwide and has opened a number of IIITs (India Institute of Information Technology) which represent an expansion of India's elite and highly selective technical institutions.

Finally, a successful software export industry may lead to improvements in Quality of Life that make the location/nation more attractive to live. Better and more attractive housing is constructed, cafes and restaurants are opened. One American software entrepreneur built an entire town in India, from scratch, calling it New Oroville (near Hyderabad). The employees are provided housing (built with ultramodern geodesic domes) that is walking distance to the office. The town has a pool, recreation center, and power generation (Swisher, 2002).

The direct economic impact of the software export industry has already been tangible in a number of nations. India's industry contributed 7% of GNP growth in 2000 (Athreye & Arora, 2002); In Israel, ICT growth (much of it in software) contributed 36% of GDP growth in 2000 and 32% of total exports (ICBS, 2001); in Costa Rica, in 2000, computer products (a larger sector than just software) accounted for 37% of national exports, ahead of some traditional agricultural exports (Digital Opportunity Initiative, 2001).

Nevertheless, the concentric circles of improved Quality of Life are still limited. In India, for example, in spite of the software boom, development is uneven, with much of the impact in development and investment concentrated in the southern city of Bangalore, with lesser concentrations in Hyderabad, Delhi, and Mumbai. It is likely that any nation that goes through a sudden growth in one sector of the economy will witness, over the short term, a growth in income disparity (dualism) leading to possible political backlash. This has been the case in for the new entrants to Tier 1, India and Israel, and to a lesser extent in Ireland. The more profound question is whether the wealth created by one sector can spread and reduce the income disparity over a longer period of time. On a more optimistic note, some may argue that the software industry's workforce is made up of the middle class which, now enlarged, is more likely to support moderate, universalist, democratic, and pro-market policies.

4. ASSESSING THE FUTURE

The debate about the impact of technology trade in general - and software exports specifically - is, to paraphrase Bhagwati (2002), representative of the current debates about the impacts of

globalization. Software exports demonstrate the advantages of globalization without many of its negatives. For software export industries in these nations do not displace workers in developing and transitional nations, but instead are crowding out workers in economically powerful nations.

ACKNOWLEDGEMENTS

I thank Robert Davison and Suma Athreye for helpful comments.

REFERENCES

Arora, A., Arunachalam, V.S., Asundi, J.M., and Fernandes, R. (2001) The Indian Software Services Industry, *Research Policy*, **30**, 8, 267-1287.

Athreye, S. and Arora, A. (2002) The Software Industry and India's Economic Development, *Information Economics and Policy*, **14**, 2, 253–73.

Carmel, E. (2003) Taxonomy of New Software Exporting Nations, *Electronic Journal on Information Systems in Developing Countries*, **13**, 2, 1-6. www.ejisdc.org.

Bhagwati, J.N. (2002) *Free Trade Today*; Princeton: Princeton University Press.

Digital Opportunity Initiative (2001) Creating a Development Dynamic. Final Report of the Digital Opportunity Initiative, http://www.opt-init.org/framework/pages/contents.html.

Economist, 2002. Outward Bound: Do Developing Countries Gain or Lose when Brightest Talents Go Abroad? September 28, **364**, 8292, 24-26.

Grossman, G.M. and Helpman, E. (1991) Growth and Welfare in a Small Open Economy, in: Helpman, E. and Razin, A. (Eds.) *International Trade And Trade Policy*, Cambridge, MA: MIT Press.

Hausmann, R. and Rodrik, D. (2002) Economic Development as Self Discovery. *National Bureau of Economic Research* Working Paper, Num. 8952, revised November 2002. http://ksghome.harvard.edu/~drodick.academic.ksg/SelfDiscRev2.pdf

ICBS (2001) *Israel Central Bureau of Statistics.* http://www.cbs.gov.il/shnaton53/dia18_04h.shtml

Kenvin, S. (1996) Birth of a VC Nation. *Red Herring*. May 1, www.redherring.com.

Krugman, P.R and Obstfeld, M. (1994) *International Economics*. NY, NY: Harper Collins.

Reizman, R.G., Summers, P. and Whitman, C. (1996) The Engine of Growth or its Handmaiden? A Time Series Assessment of Export-Led Growth, *Empirical Economics* **21**, 1, 77-110.

Tigre, P.B. and Botelho, A.J.J. (2001) Brazil Meets the Global Challenge: IT Policy in a Post-Liberalization Environment, *The Information Society*, **17**, 2, 91-103.

Swisher, K. (2002) Silicon Valley Veteran Starts US-Style Tech Town in India, *Wall Street Journal*, January 7.

Wignaraja, G. (1999) Competitiveness in a Rapidly Globalizing Economy: Lessons of Experience, *International Labor Organization* Working Paper, http://www.ilo.org/public/english/employment/ent/papers/pmd-2.htm.

Yang, Y. (1993). Government Policy and Strategic Industries: The Case of Taiwan, in: Ito, T. and Krueger, A.O. (Eds.) *Trade and Protectionism*, University of Chicago Press.