Political economy of technology transfer

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Every year, new health products and know-how become available: statins, new antibiotics, telemedicine, insurance know-how, imaging techniques, and genomics, to name a few. At the same time, major barriers to transferring information and technology between countries are falling with expansion of the internet and online health training programmes, the growth of information about the relative effectiveness of different technologies,[1] and the liberalisation of trade. It might be reasonable to expect that global transfer of health technologies would take place more rapidly and in greater quantity to benefit "haves" and "have nots" alike. There is no evidence, however, that this is taking place. On the contrary, appropriate health technologies may become more unequally distributed than ever. Why?

Summary points

Less than 1% of global research and development is currently spent on technological innovations for poor countries

The World Trade Organisation agreement enforcing trademarks and patents will increase the price poor countries pay to gain access to new, patented technologies

It is unclear how such legislation will improve the health or wealth of impoverished countries, in the short or long term

Active policies rather than passive diffusion are needed to distribute new technologies to people and countries unable to generate profit for suppliers

Demand factors

Economic demand for health technologies by individuals, governments, and insurers is determined by factors such as purchasing power, technological capability, purchaser priorities, and unequal information.

Purchasing power

One of the main reasons why people cannot get the health technologies they need is because they cannot afford them. For example, few African parents can afford the antibiotic ceftriaxone, the most effective treatment for one of the main causes of infant death each year, *Streptococcus pneumoniae*.[2] Nor will most people be able to afford medicines for cardiovascular disease, the biggest projected killer in developing countries by 2020,[3] as they exceed the annual incomes of most patients (table 1).

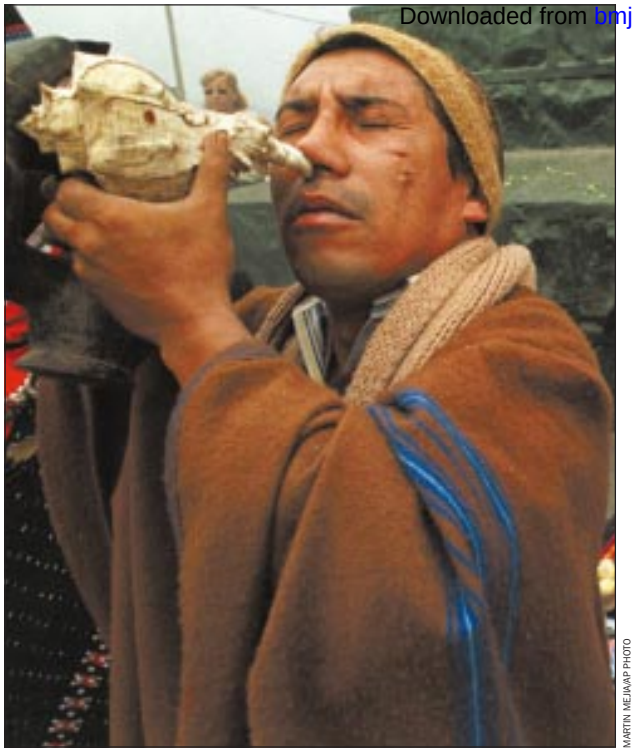
The importance of purchasing power to technology transfer may increase as trade is liberalised under worldwide enforcement of the World Trade Organisation's trade related aspects of intellectual property rights agreement (TRIPS). The treaty strengthens international enforcement of property rights, such as patents and trademarks, thereby enhancing companies' ability to charge premiums for new medical technologies and to ensure that they are not copied locally. For example, if the application is successful, an American owned patent for the active ingredient of the Indian nim tree is likely to make incursions into local markets for traditional preparations. People may be forced to buy similar products at higher prices from the company owning the patent. The same will be true for ayahuasca, a medicinal plant from Ecuador which is used in psychiatric drugs, for which another US company is currently seeking a patent.[7] A report in 1994 estimated that developing countries pay $5.4bn (£3.6bn) each year in royalties on pharmaceutical and agricultural products derived from indigenous plants,[8] while overall costs of licences and royalties for foreign technology rose from $6.8bn in 1976 to over $60bn in 1995.[9] These figures are almost certain to rise further with enforcement of TRIPS.

Many people hope that trade liberalisation and patent protection will encourage suppliers to spread technology to people in poorer countries who can afford to buy them. However, there is little evidence that such uneven technology transfer provides wider benefits, such as better care for the general population or transfer of specialised skills. In the absence of effective anti-corruption legislation, private clinics equipped with the latest

Table 1 Ranked costs of effective health technologies and annual per capita incomes for less developed countries

Country/health technology	*Cost of health technology ($US)*[4]	*Annual GNP per capita income ($US)*[5]
United Republic of Tanzania		120
Ceftriaxone: 7 day course	130	
Malawi		170
Chad		180
Bangladesh		240
Haiti		250
Benin		370
Streptokinase: one course after infarction	400	
Angola		410
Simvastatin: one year course	480	
China		620
Congo		680
Simple computer plus modem and phone line to access internet for health information	700	
Egypt		790
Solomon Islands		910
Philippines		1050
One course of treatment for multidrug resistant tuberculosis (mid-point cost)[6]	5 400	
Barbados		6560
Annual subscription to full text medical literature database (eg, OVID) to supply health information	8 000	
Slovenia		8200
HIV triple therapy course: one year	16 000	

GNP=gross national product.



MARTIN MEJIA/AP PHOTO

An Andean soothsayer inhales hallucinogenic ayahuasca from a shell: if the United States succeeds in patenting the ayahuasca plant, many South Americans will have to pay for it

technologies are more likely to fuel black market trade in illegally procured goods than the productive spread of know-how.[10 11]

Technological capability

People may not get the technology they need because the country or region lacks the structural capacity to use and maintain it. Effective technologies for people in developing countries, such as limb microsurgery, telemedicine, and primary care services, require a skilled workforce, equipment, and spare parts as well as a functioning economy and political system—requirements that many countries lack. Technological capability can be improved by aid agencies, but usually much greater structural change is required to enable widespread use of new technologies. International literature is littered with examples of well intended aid plans that underestimated requirements for technological capability.[12]

Purchasers' priorities

Another reason for people not getting the most appropriate technology is the priorities of those who purchase health technologies on their behalf. For example, many Roman Catholic and Islamic women have no access to birth control because their health systems and governments do not allow it. Donor countries and companies may buy technologies for poorer countries according to their own needs to expand markets or to dump irrelevant, old, or even harmful technologies.[13] Common problems affecting pharmaceutical company donations include drugs being close to expiry, irrelevant to local people's health problems, unsorted, mislabelled, and not complying with local standards or administrative procedures.[14]

Unequal information

Finally, people may not get appropriate health technology because they and health professionals are swayed by poor quality information, such as advertising, rather than by independent, objective information about the relative benefits, harms, and costs of the technology. Few countries have health technology assessment programmes to help discriminate between technologies, and many poor countries have no needs based health system. In most countries branded drugs are more popular despite being more expensive and of no better quality than non-branded generics. This is largely because of advertising and the absence of easily accessible information on cost effectiveness for patients and health professionals.[15 16]

Supply factors

On the supply side, technology transfer is affected by how suppliers—companies, governments, non-profit making organisations, and international organisations—appraise the costs, risks, and likely benefits of making health technologies available.

Cost and risks of supplying technologies

Suppliers are unlikely to spread technologies if they think the costs and risks of doing so are too great. Costs of supplying health technologies can be increased or offset by local tax and subsidy policies, including assistance from research and development programmes. Such policies usually require a stable government and legal and money lending systems, which again are typical of richer rather than poorer countries. Suppliers are also unlikely to sell technologies or invest in joint ventures with countries facing the risks inherent in major political unrest or war. The supply of medical technologies all but collapsed, for example, in war torn Colombia and Serbia.[17 18]

Similarly, supplying technologies, from keyhole surgery to dental equipment, requires structural support such as sufficiently skilled labour, material inputs, credit, laws to enforce contracts and tax collection and to prohibit corruption, and a stable distribution network.

Returns on investment

Suppliers' perception of benefits (returns on investment) is perhaps the greatest factor affecting supply and distribution of health technologies. Few suppliers are interested in developing technologies for people unlikely to be able to pay much for them. For example, oily suspension of chloramphenicol is as effective and easier to use than ampicillin for treating epidemic bacterial meningitis caused by *Neisseria meningitidis* and one tenth its price, but no drug company seems interested in making it as profits would be relatively small.[2] On the other hand, companies are keen to get as much return on past investment as possible, sometimes even for products found to be ineffective or harmful. For example, the drug dipyrone was withdrawn from Germany in 1987 because of adverse effects but continues to be sold in most developing countries. It was one of India's top selling drugs in 1995.[16] Mass migration of highly trained health professionals continues from poor countries to rich ones, where salaries are higher and political security assured; 75% of all migrant doctors work in the five countries Australia, Canada, Germany, the United Kingdom, and the United States.[5]

In theory, TRIPS legislation, which protects companies from local people copying patented technology, should encourage production of drugs for developing countries. Yet, current trends in new drug output do not look promising. The World Health Organisation estimates that of the $56bn spent each year on health research, less than 10% is spent on diseases known to affect 90% of global population. Of 1223 new compounds launched between 1975 and 1997, 11 were designed for tropical diseases.[19] Two such products have been produced since the TRIPS agreement in 1994.[2]

Political factors that determine demand and supply

Not all technology transfers are desirable. Many technologies are not cost effective and some are harmful. In terms of health gain, more important than people's capacity to obtain technologies is their ability to choose between them using sufficient information about their benefits, costs, and harms. In turn, choice of technology depends on the political relationship

Table 2 Ranked sales of countries' gross national product and of selected pharmaceutical companies' total sales, 1997

Country/pharmaceutical company	*Annual gross national product (US$bn)*[20]	*Total annual sales (US$bn)*[21]
Lebanon	13.9	
Glaxo Wellcome		11.6
Merck		11.4
Novartis		11.0
Oman	10.6	
Bulgaria	9.4	
Kenya	9.3	
Bristol Myers Squibb		9.3
Zimbabwe	8.6	
Pfizer		8.4
Lithuania	8.3	
Roche		8.0
Bolivia	7.4	
Jamaica	4.0	
Angola	3.8	
Cambodia	3.2	
Haiti	2.5	
Macedonia	2.2	
Armenia	2.0	
Chad	1.6	
Lesotho	1.4	
Burundi	1.2	
Genetech		0.97
Sierra Leone	0.9	

between those buying and selling technologies, as well as between purchasers of health care and its recipients.

Most developing countries, with gross national products far below the total sales of many large companies (table 2), lack the political muscle to set the rules determining international trade, such as the TRIPS agreement. Furthermore, individuals in many of those countries, who have no effective political representation in government or evidence based health systems, are unlikely to demand the health technologies they need and resist the ones they do not. Experience suggests that in the absence of strong, highly skilled and non-corrupt health systems, private suppliers readily sell inappropriate technologies to people ill equipped to demand anything better.

Many people hope that liberalising information and trade will result in a trickle down of beneficial technologies to poor people. Yet there is no evidence that trickle down is likely unless enforceable mechanisms are developed to promote and distribute technologies according to health gain rather than simply for profit. These might include national and international laws to protect indigenous peoples against patents that would deprive them of local technologies or to ensure that they get a share of the profits; crossborder technology transfer arrangements; subsidies to promote the development of less profitable interventions; economic development to create sustainable markets for poor people; donations of effective drugs, and mechanisms to increase access to reliable information about health technologies.

Several substantial programmes are currently under way. The quality of donations by pharmaceutical companies has recently improved, perhaps with increased awareness of problems and the development of guidelines. It may improve further with more widespread monitoring and adherence to recent recommendations about drug donations developed by a consensus of stakeholders (companies, recipient governments and health facilities, the WHO, and private voluntary organisations).[22] Several programmes currently use a variety of mechanisms to increase access to vaccines, including subsidies and tax credits, research gifts in kind from pharmaceutical companies, preferential investment in companies that agree not to enforce patents in poor countries, and cash donations.[19] So far, however, none of these seems likely to sustain research and development for poor countries at affordable prices without the kind of global backing given to treaties like TRIPS. It remains to be seen whether heart-lung transplants will make it to Niger.

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1 Warner DC. The globalization of medical care. In: Zarrelli S, Kinnon C, eds. *International trade in health services: a development perspective*. Geneva: UN Committee on Trade and Development, World Health Organisation, 1998:71-7.
2 Pécoul B, Chirac P, Trouiller P, Pinel J. Access to essential drugs in poor countries: a lost battle? *JAMA* 1999;281:361-7.
3 Murray CJL, Lopez AD. *The global burden of disease: summary*. Cambridge, MA: WHO, 1996:37.
4 British Medical Association, Royal Pharmaceutical Society of Great Britain. *British national formulary.* London: BMA, RPS, 1998. (No 36.)
5 World Health Organisation. *The world health report* 1998. Geneva: WHO, 1998.
6 Heymann SJ, Brewer TF, Wilson ME, Fineberg HV. the need for global action against multidrug-resistant tuberculosis. *JAMA* 1999;281:2138-40.
7 Simms A. *Selling suicide: farmers, false promises and genetic engineering in developing countries*. London: Christian Aid, 1999.
8 Rural Advancement Foundation International. *Conserving indigenous knowledge: integrating two systems of innovation. An independent study*. New York: UN Development Programme, 1994.
9 World Bank. *Knowledge for development.* Oxford: Oxford University Press, 1999.
10 Abbasi K. The World Bank and world health: focus on South Asia.1. Bangladesh. *BMJ* 1999;318:1067.
11 Wuyts M, Mackintosh M, Hewitt T. *Development policy and public action*. Oxford: Oxford University Press, 1992:99-100.
12 Ferguson J. *The anti-politics machine. "development," depoliticization, and bureacratic power in Lesotho*. Minneapolis: University of Minnesota Press, 1994.
13 Chetley A. Struggling for clear policies. In: *A healthy business? world health and the pharmaceutical industry*. London: Zed Books, 1990:68-93.
14 World Health Organisation. *Guidelines for drug donations*. Geneva: WHO, 1996.
15 Waud DR. Pharmaceuticals promotion—a free lunch. *N Engl J Med* 1992;327:351-3.
16 Chowdhury Z. *The politics of essential drugs. The makings of a successful health strategy: lessons from Bangladesh*. London: Zed Books, 1995.
17 Veeken H. Colombia: the winner takes all. *BMJ* 1998;317:1649-50.
18 Black ME. Collapsing health care in Serbia and Montenegro. *BMJ* 1993;307:1135-7.
19 Balms for the poor. *Economist* 14 August 1999:69.
20 World Bank. *Knowledge for development.* Oxford: Oxford University Press, 1999
21 Survey: the pharmaceutical industry: the alchemists. *Economist* 21 February 1998.
22 Reich MR, ed. *An assessment of us pharmaceutical donations: players, processes, and products*. Boston: Harvard School of Public Health, 1999. (www.hsph.harvard.edu/faculty/reich/donations)