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**EFFECT OF ARTIFICIAL INTELLIGENCE ON THE PATTERN OF
FOREIGN DIRECT INVESTMENT IN THE THIRD WORLD:
A POSSIBLE REVERSAL OF TREND**

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*Speech delivering her paper at the Sutton Colloquium,
University of Denver Sturm College of Law,
March 11, 2007*

I. INTRODUCTORY REMARKS

My paper presents a hypothesis about the future trends of outbound foreign direct investment (FDI) to Third World countries, brought about by large-scaled industrial applications of optimum Artificial Intelligence (AI) in the 21st century.

To many, the term AI may suggest a vision of the future. If it is, then the topic is indeed an ambitious venture for any international business transactions (IBT) lawyer who chooses to branch out of her specialty to deal with technology, applied mathematics, and economics in exploring the impact of AI. Some may think that I have boldly chosen to turn myself into a futurist.

Yet, I do not view my paper as being overly futuristic. I want to clarify that this is not a scientific or economic paper. The paper is written for a general audience of lawyers, and the language that I use is that of a lawyer, not of an economist or a scientist. FDI and the pattern of global economic development are my core specialties and the concentration of my scholarship interests.

The hypothesis I present here is based on past and present events and data:

First, AI is not something new. It has been used in military and commercial applications since the time of the two World Wars. Then, during war-time, it was called "Operational Research."

Second, AI has also frequently been used in past and present industrial applications to change factory outputs and production system designs, with substantial macroeconomic impact already felt by society. What I look at now is

* Assistant Professor of Law, University of Denver Sturm College of Law. Professor Duong's speech was based on her Work-in-Progress regarding the effect of artificial intelligence on foreign direct investment in Third World societies. Because this is a speech, side headings have been inserted to enhance readability.

the role and impact of *optimum* AI in the New Economy – an economy where Information and Knowledge are considered production factors.

Third, as of the beginning of the millennium, there have already been changes in FDI patterns, as well as in corporate behaviors, which lend support to this paper's hypothesis. I will explore this evidence in the later part of my presentation.

II. THE THESIS

Let me first summarize my thesis:

My paper predicts that AI can stop the outbound flow of FDI from the developed world to the Third World by changing investor behaviors and eliminating the Third World's comparative advantages. I use the term "Third World" for convenience only, to refer to the least and/or lesser developed Asia, the Americas, and Africa collectively, without indulging in any value system that rates these cultures prejudicially. Quite to the contrary, I consider myself an advocate for Third World inhabitants because their voice is often not heard.

Contradictory to the common belief and conventional wisdom that high tech will better humankind and create new jobs and skills, large-scaled industrial applications of optimum AI can do just the opposite – AI can "ghetto" the already disadvantaged Third World workers and make Third World countries poorer, turning them into producers of cheap raw materials and agricultural products, while eliminating them from the "Information or Knowledge-Based Society" that characterizes market competition in the 21st century. Thus, in this modern age, AI can facilitate and bring about the return of 19th century colonialism, all over again. The vision I see may be counter-intuitive to the traditional legal thinking by international trade and FDI experts.

III. EXPLORING THE THESIS AND BACKGROUND INFORMATION

The topic came to me when I read an article by the Science editor of MSNBC on the internet this past month (March 2007): "*Someday you could be taking orders from a robot, but in a nice way...*" The article talked about human-robot interaction and the work of the American Association for the Advancement of Science. The article also discussed the work of an MIT scientist on robotic technology. Robotic technology is but one application of AI.

The article also mentioned "*fear*" as a factor in this new robot-assisted society. So, my vision today - the impact of AI on the Third World - may sound an alarm, foretelling a rather gloomy picture for tomorrow's unskilled workers: that AI can "ghetto" them.

The problem is not confined to the Third World. The "ghettoing" of unskilled workers can also take place in a developed economy like America. That adds to the notion of "*fear*."

To begin with, based on the data released by UNCTAD (United Nations Conference on Trade and Development),¹ you can see that US-based multinationals dominate the FDI scene – their foreign assets, foreign affiliates, and foreign employees, *both* in Financial Services *and* Manufacturing and Production of Consumer Products. For example, a diversified giant like GE appears under both categories of the UNCTAD report. The picture is obvious: big American businesses bring their capital and technology abroad. They are the businesses most financially capable to fund and develop AI.

But what is AI? Here is an IBT lawyer's simplified definition: it's the *simulation* of the human brain *by a computer*. In AI research, scientific efforts are made to identify those superior functions of the brain that can be *simulated* – for example, what an engineer will do to come up with the system design for factory production. Then, mathematical models, *especially algorithm*, are used to express, memorialize, and document these human brain functions. The models are then fed into a computer, such that when a standardized instruction or an inquiry is given, the computer will generate the result exactly like the work product of the engineer. This enables the computer software to replace the engineer.

Thus, AI is the modelization of the human brain and its various functions. For example, one of the most spectacular results in AI research has been the "recognition of form," i.e., the capture of visual information by an artificial retina.

But one thing remains, or at least I believe and hope that you agree: AI cannot replace human aesthetic and moral expressions and choices, or decisions that require emotions, passion, imagination, the judgmental process of weighing consequences, or the human wisdom of predicting the future with nuances. AI cannot and should not compete with Homer or Shakespeare; nor should it replace the decision by the White House on whether, or where, to drop a bomb.

AI is just one aspect of an information-based civilization. We are in an era where, as the cliché goes, information, or knowledge, is power. Information becomes the "added value." Take an example, the computer chip. In my layperson's understanding, it is a piece of *Silicium*—the scientific name for a piece of sand. Sand is a very common and worthless material. What gives it meaning and value is the information that the chip contains. With the information imbedded in it, the piece of sand – the computer chip – is no longer worthless. Instead, it now has tremendous added value. Economic value.

Our modern information-based society is no longer the industrialization model of the 19th century that motivated colonialism. In the 20th century, big businesses and consumer commodities producers took their manufacturing to the developing economies for cost savings, including cheap labor and the exploitation of raw materials at the source. Added to this bundle of advantages was the convenience of a transitional, developing, and therefore a flexible frontier system

¹ See The Top 50 Financial TNCs, Ranked by the UNCTAD Spread Index, 2004, 16/10/06 (WIR/2006/TNCs), http://www.unctad.org/sections/dite_dir/docs/wir2006top50_spreadindex_en.pdf (last visited May 7, 2008).

of commerce and national law (or lack thereof). This has been the motivation behind multinationals' predictable patterns of business conduct in the Third World. Activists have critically called this phenomenon or trend "neo-colonialism."

Now this thing called AI – how can it potentially reverse, if at all, this pattern of conduct?

IV. THE EMBLEMATIC CASE

Let's take a case study involving a Western European business that manufactures a product quite suitable for AI application: ready-made, self-assembled, do-it-yourself furniture that comes in a box, made out of cheap wood but of functional design, sold inexpensively in low-priced department stores, made in places like China, Vietnam, India, Romania, etc. I built this hypothetical case based on real-life confidential data by interviewing business executives and start-up high-tech professionals.

For several years, this business has steadily experienced an annual increase in turnover of 15%. So, expansion in manufacturing is a natural course. But, because of the high costs of increasing manufacturing capabilities in Western Europe, without AI, the business would have considered taking manufacturing to, for example, Asia, for raw supplies, cheaper labor, plus lesser regulation.

Now, with AI: this shift to Asia is no longer a must for this business. To summarize the confidential business and technical data I gathered from my interviews: now the business can staff a "*digital factory*" in its home country with *only* about five employees trained in the operation of AI *system design* (as opposed to 800 employees in a factory environment without optimum AI).

In summary, without AI, home-country manufacturing can be too high a cost for a growing business. Therefore, it must go abroad to Third World manufacturing sites where costs are lower, even if those places offer high political risks and no consumer market potential.

Now, with AI, the business does not have to go abroad, unless going abroad is where the highest profit and the most business advantages can be found: lowest costs in total, highest savings for highest quality and quantity of production, which ultimately lead to the lowest price to attract the largest consumer base.

So, optimum AI can stop the existing trend and pattern of bringing manufacturing (and hence technology transfer plus management training) to the Third World, unless the developing economies can offer multinationals other competitive advantages like additional savings in distribution/transportation, and a huge and eager national and/or regional consumer market.

Hence, this furniture manufacturer may still want go to Asia for manufacturing, with the AI technology and only five employees, because of the other competitive advantages that the developing economies of Asia may have to offer. For example, with the availability of AI technology, the products can still be inexpensively manufactured in Asia, to be sold cheaply into the huge consumer markets of China and India, with additional savings in regional distribution, delivery, and transportation.

In this case study, in an optimum AI environment where the software has replaced humans, the education and skill sophistication of the native workforce will no longer matter. At optimum capacity, AI technology can result in mass production of self-assembled furniture boxes at the simple pushing of a button, no more no less than the instantaneous production of thousands and thousands of... sausages!

What happens to the potential cheaper labor workforce of Asia in such an optimum AI environment, then? In the new AI-assisted system design, human labor can be reduced to the bottom level of the skill sophistication ladder – only those trivial support tasks that require no to little training, technology transfer, or higher wages are now performed by humans.

AI can literally eliminate the “middle level” of native labor where training and technology transfer once typically occurred – those mid-level supervisors who used to handle machineries and make the system run by exercising and implementing human decisions. Now, AI will be doing their job. The foreign investor (i.e., the multinational) can now limit knowledge of the AI system design to the “privileged few” in the native population who can receive the knowledge-base crucial to AI — only those “privileged few” can afford and are given the opportunity to join the information-based global society. Thus, AI can tremendously increase the gap between these few ruling elites and the massive bottom-level workforce, bringing the scenario back to the 19th century model of production, despite the high-tech sophistication of the “digital factory” work environment.

Now the danger has fully emerged: AI, in optimum form, can “ghetto” Third World workers to that bottom level of wage-earning skills by eliminating their upward mobility to the middle level. AI thus pushes the uneducated native workforce to the lowest echelon – the *ghetto*, and creates a very small native ruling class having access to information.

I believe this is the concern held by more and more experts including the former chief economist of the World Bank and a Nobel price winner in economics. Concerns for the lowest level of the global workforce living at poverty without education thus necessitate a new system of global regulation for the informational civilization — the information society must be regulated in order to balance out the imbalance of access to information and education.

So, in such a vision, what good does it do for a Third World country to join the WTO? Free trade will only enable such Third World country to keep on exporting raw materials and agricultural products to feed the world, a world ruled by the high-tech producers.

The “ghetto’ed” Third World will be doomed to the task of supplying cheap raw material products for the rest of the world — while becoming consumers of high-tech products, totally dependent on the technological innovation of the superpowers. The pattern that we have seen and will be seeing is something like this: the developing nations sell raw material; the industrialized nations sell high tech. The industrialized nations control, and the developing nations are controlled.

AI can perpetuate this imbalance.

As I will point out before ending, there is no easy or immediate solution. In a world still divided by national laws and physical borders, legal solutions are especially slow-coming.

Therefore, it's about time that the developing nations realize their dilemma and immediately devise very wise policies (such as the experience of South Korea and Taiwan, in some analysts' views). One primary policy should be to invest immediately in the education of the workforce and to give them the "gray matter" – the added value needed in any "exchange" or negotiation with the multinationals and superpower governments.

The solution thus lies in structural changes to the political and economic system of the Third World countries, something that can be brought about only by the ruling elites. If these governments invest in the education and freedom of information for their people – the entire workforce and not just the "privileged few," the Third World may come out ahead in the global informational society. If not, that bright future for an AI civilization that should better serve all humans can just be more of a doomed fate for the poor and uneducated Third World worker.

This is not just a Third World issue. This gloomy picture of ghettoing certain segments of the population can also occur in the developed nations: certain labor segments of the developed economies such as women, disadvantaged minorities, and undocumented aliens can also be denied full opportunities or access to value-added information.

V. NOW, A REALITY CHECK

Recent and current business and corporate behaviors already show signs that lend support to my hypothesis. The following examples, based on the Organization for Economic Cooperation and Development (OECD) data, and the experiences of Vietnam and France, demonstrate the point.

First, the transformation of our modern society into the New Economy is evident. OECD statistics released in 2000 showed that as of 1999 (just before the current millennium), private investment in equipment and software in the Information and Communications Technology sector (ICT) totaled approximately 900 billion dollars. Since 1990, approximately one-fourth of corporate investments have been devoted to the production or purchasing of knowledge. Yet, there has also been a recent drop in global FDI, signifying changes in FDI patterns that appropriately call for closer scrutiny of global production chains. Meanwhile, data of past decades show that where possible, transnational corporations have always resisted technology transfer to the Third World, even if the transfer was in the form of intra-firm transactions. Multinationals were attracted to the building of Research & Development (R&D) facilities in the developing nations only in exceptional cases where adequate infrastructure and high-quality local personnel existed. The bulk of R&D facilities has always remained within the industrialized countries. Overall, although world trade has soared, the expansion has remained unevenly distributed, and the "Least Developed Countries" (LDCs) have sustained a proportional decline in their share of global markets, despite free trade. One can reasonably conclude that strong pressures exist to privatize scientific knowledge

and technology, but only within the investors' borders or within the developed world.

Second, there has been a dire need and willingness for multinationals to absorb foreign Information Technology (IT) workers (from the developing economies such as China and India) to serve corporate demand for technology invention and production. Statistics show that multinational firms have gone overseas to acquire and exploit labor skills for the IT market. The largest net loss of engineers appeared to be in non-OECD countries, and both India and Israel have been home to software development centers for Hewlett-Packard, IBM, Intel, and Microsoft. At the same time, again, for cost savings, transnational businesses have also outsourced routine technology-related work, or menial, repetitive service tasks supporting computerized operations to the developing nations.

Third, FDI flow from the developed nations may no longer just reflect the type of human labor considerations that render the Third World attractive. A substantial portion of outbound FDI has been poured into the wealthy developed nations, where labor is much more expensive. FDI statistics show that today, perhaps big businesses may not be as motivated to take their FDI to the developing nations as they tended to do decades ago. For example, FDI into OECD countries in 2006 reached its highest level since 2000, led by the U.S. and followed by France. The OECD report on Trends and Recent Developments in Foreign Direct Investment forecasts inflow of FDI to its 30 member countries to increase by 20% in 2007. This suggests that perhaps the reversal of FDI pattern envisioned in my paper may already have happened.

Let's look at FDI in France as another example. Recent statistics shows that as of 2006, on France's stock market index CAC40 (the French equivalent of Dow Jones), aggregately 46.2% of French corporate ownership is non-resident. Similarly, in order to service all of Europe, Toyota has recently set up manufacturing in France (rather than the choice of the developing Eastern Europe). These facts indicate that major investors from the developed nations are no longer deterred by (i) the high costs of living and doing business in France, or (ii) other complex workforce or labor issues unique to France (e.g., the history of France's organized yet turmoiled union system, plus the extraordinary high tax paid by workers to fund France's social benefits). It follows, therefore, that big businesses' decisions to invest in France must have been prompted by considerations other than costs of labor or costs of doing business in a foreign country. The considerations may include the attractiveness of doing business in France: excellent infrastructure, high productivity and skill levels of researchers, technocrats and management personnel (i.e., the kind of workers least likely to be pushed down into the ghetto in the AI revolution), and, last but not least, excellent quality of life — In France, workers enjoy a 35-hour work week, five weeks' annual vacation, hefty government-secured social benefits, trendy, first-class cultural lifestyle, healthy sports such as bicycling and soccer, gourmet food, beautiful sceneries, and easy access to the cultural centers and world-class tourist attractions and resorts of Europe.

Take another example: the apparel fashion industry in France. What happens there may also confirm the beginning of FDI trend reversal. This type of industry,

for which France is world-famous, is known to have applied AI effectively to the manufacturing side of the business, thereby freeing the human brain for more aesthetic design innovation. A look at this industry suggests that not all French producers have been too keen on shifting manufacturing to the Third World. One plausible explanation is the possibility that advanced technology (such as AI) has kept costs sufficiently down for French producers to retain production (and the accompanying know-hows) within their home country.

Fourth, nowadays, technology exporters also look at other advantages offered by the host country such as the local and regional potential consumer market. The example of Intel Corp.'s 2005 plan to invest in an assembly plant in Asia for its personal computer manufacturing demonstrates this trend in corporate thinking. The semiconductor giant went to South and Southeast Asia for cost savings. Vietnam was considered because of its demonstrated consumer potential – Internet usage has soared in the communist country, which has emerged as the fastest growing personal computer market of all ASEAN nations.

Fifth, the case of FDI into Vietnam may also demonstrate the emerging changing pattern in FDI. Complex, multi-layered FDI considerations no longer depend solely on the cost of labor or initial capital outlay or overhead. For example, both Intel and Proctor-Gamble considered manufacturing in Vietnam. Yet, Intel went ahead with the plan, while Proctor-Gamble reportedly suffered from large losses and abandoned the project. Apparently, the cheaper labor and low cost of doing business in Vietnam do not provide sufficient incentives for Proctor Gamble to further its investment plan there. In contrast, Intel's decision to establish manufacturing in Vietnam could result from, *inter alia*, (i) Intel's assessment of Vietnam as the potential consumer market for personal computers; and (ii) the success that Intel has had with the hiring of Vietnamese IT personnel – an indication of the “gray matter” potential of Vietnam, at cheaper costs. Obviously, the local “gray matter” potential is more essential to Intel's technology business, compared to Proctor-Gamble.

Last, the case of China will also offer evidence that supports the hypothesis expounded in my paper. For example, experts describe technology trades to and from China as “triangular” – parts for electrical devices produced by Japan and other newly industrialized Asian nations are exported to China (as well as other ASEAN countries) for assembly, and then the finished products are exported to Europe and North America, among which are intra-firm re-exports. Thus, China (as well as other ASEAN countries with cheap labor as their comparative advantage) has been a huge assembly hub and production site for low-tech goods. This triangle has been an important channel for technology transfer, and has accounted for China's claim of rapid improvement of the high-tech content of its foreign trade. Yet, according to World Bank studies, the technology upgrades of China (and other ASEAN countries) remain circumscribed to the production and export network of foreign firms and, therefore, dependent on the multinationals' foreign affiliates. This presents an impediment to the widespread dissemination of technological know-hows, although these high-tech imports have been used in substitute for local R&D commitments.

These signs show that the developed nations' technology producers will continue to look at the developing world for cost-savings, and for skilled or unskilled labor supply either via (i) outsourcing or shifting menial production, low-tech production, hardware assembly, or trivial service tasks to the developing nations, and/or (ii) importing migrant technology workers or foreign "gray matter" to the developed countries and purchase this "brain migration" at much lower costs. At the same time, technology producers will always be looking at the developing world as potential consumer markets. The futuristic optimum application of AI will broaden and lend more meaningful nuances to investors' FDI choices, but those same AI-driven choices may ultimately hurt the native workforce and jeopardize the national interest of the developing host countries.

VI. SUMMARY AND SOLUTIONS

My paper points out the need for systematic, coordinated transnational regulation. The paper argues for global regulation in all relevant areas of the law. To enable global regulatory solutions, nations must develop a global mechanism that consists of transnational bodies with real enforcement powers to perform the following tasks:

- 1) Global labor law and policies must be developed, beyond the current schemes offered by the WTO, ILO, and/or NAFTA frameworks.
- 2) Global intellectual property law and policies must be reviewed, developed, and integrated, beyond the current regime of TRIPS.
- 3) Global anti-trust laws and policies must also be developed.
- 4) Global technology licensing laws, policies, and formalized norms are critically needed.
- 5) Concepts of sovereignty and national laws' extraterritorial prescriptive jurisdictional power must also be reassessed toward universalization, with regional and world peace and antiterrorism measures as shared goals.
- 6) Likewise, national laws and policies on technology export control, immigration, and communication must also be reassessed.

The review, development, and reassessment in the areas of law identified above must be done with a view to prevent and equalize the knowledge gap and the new division of labor envisioned in my paper.

To explore the future of global regulation, the paper presents a bird's eye view and performs a cursory evaluation of the current legal system in those same relevant areas of law (intellectual property, antitrust, labor, licensing and technology transfer, and internet/digital communication). The paper demonstrates that historically, the universalization of law in these areas has not completely been successful, and that law has always lagged behind economic events and other societal changes. Law becomes the confirmation and documentation of changes, rather than the initiation of changes, which typically rests with political and social movements that precede law. The drawbacks of the current legal system, therefore, lie in the clear fact that efforts at forming global technology transfer

codes have failed. The paper concludes that the existing bedrock of sovereign powers has immobilized or slowed down the prospect of successful integrated global regulation.

Rather than mapping out detailed legal solutions in a utopian manner, the paper chooses instead a "design notes" approach. It suggests a general policy framework for any future integrated transnational regulatory scheme. For example, the paper argues that certain fundamental economic concepts underlying the New Economy should be transported into law, and proposes a new definition for "Knowledge" to be used as a law- and policy-making framework in the New Economy. The paper argues that global regulation should aim at Knowledge as a new production factor under the philosophy of Sustainable Development (as that concept is extended to international law and global economic development, rather than remaining purely as an environmental law concept). The new definition of Knowledge can necessitate a broad, systematic, and drastic change to the current legal system of patentability or copyright protection for intellectual property.

Because the global legal project has not been realized and law is generally behind political and economic realities, the practical and more immediate solutions, therefore, must be sought in the domain of education and politics. This means that Third World governments must devise and implement fast-tracked policies that help their workforce become technologically independent. Yet, for these policies to take place, there must be structural changes and political reforms in many countries of the Third World.

This final point can be viewed as a bold statement for the 21st century: the only real solution that can effectively protect the global workforce must lie in a revolutionary framework that can somehow transcend, or even abolish, the existing sovereign structure in order to achieve universal, transnational democracy.