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Foreign Manufacturing Multinationals and the Transformation of the Chinese Economy: Faustian Bargain to Trade Technology for Access?

I. Summary

What is the relationship between foreign manufacturing MNCs and the expansion of indigenous technological and managerial technological capabilities among Chinese firms?[1] How are foreign manufacturing MNCs changing the skill-intensity of activities and the extent of value-added of operations within the domestic Chinese economy?

To what extent, might foreign direct investment be helping propel China to become an export superpower, "displacing Japan as the predominant economic power in East Asia", as Ernest Preeg declares, making the country the "economic hegemon" in the region? [2] Are multinationals "trading technology for sales in China"?[3]

China has been remarkably successful in designing industrial policies, joint venture requirements, and technology transfer pressures to use FDI to create indigenous national champions in a handful of prominent sectors: **high speed rail transport, information technology, auto assembly, and an emerging civil aviation sector**. Prominent North American, European, Japanese, and Korean manufacturing multinationals rightly fear that they may find themselves launching rivals to their own market position when they weigh access to the

[1]This Statement draws directly upon *Foreign Manufacturing Multinationals and the Transformation of the Chinese Economy: New Measurements, New Perspectives*. Washington, DC: Peterson Institute for International Economics, Working Paper, forthcoming 2011.

[2] Ernest H. Preeg.2008. *India and China: An Advanced Technology Race and How the United States Should Respond*. Washington, DC: Manufacturers Alliance/MAPI. p. 141-143, 69-71.

[3] David Barboza, Christopher Drew, and Steve Lohr. 2011. "Trading Technology for Sales in China". *The New York Times*. January 18, p. B-1.

vast Chinese market against technology acquisition and management imitation on the part of Chinese partners and other indigenous competitors.

Bringing in new technology to gain access to the Chinese market – whether for domestic market penetration or as a base for exports – may therefore often appear to individual foreign multinationals as making a Faustian bargain with the devil. "China can strike deals," asserts Steven Pearlstein, "that may provide short-term profits to one company and its shareholders but in the long run undermine the competitiveness of the other country's economy." [4]

But what is striking in the aggregate data is *how relatively thin* the layer of horizontal and vertical spill-overs from foreign manufacturing multinationals to indigenous Chinese firms -- and consequent export externalities -- has proven to be.

Despite the large size of manufacturing FDI inflows, the impact of multinational corporate investment in China has been largely confined to building plants that incorporate capital, technology, and managerial expertise controlled by the foreigner. Within this foreign firm-dominated production array, moreover, FDI payments for Chinese materials and labor used in the operations of the foreign plants have increased as domestic value-added has increased, as Nicholas Lardy shows.[5] But Robert Koopman, Zhi Wang, and Shang-Jin Wei find that the expansion of domestic content (and, conversely, decline in the import content) is concentrated at the low-skill intensive sectors of processing trade exports. [6] As the skill-intensity of exports increases, the percentage of the value of the final product that derives from imported components rises sharply.

From a novel comparative perspective, the share of domestic value-added in FDI operations in China in high skill-intensive sectors such as computers and telecommunications ranges from *less than one-half to slightly more than one-half* of what is found in other developing countries where comparable measurements can be made, such as Mexico. Econometric analysis and survey data show that neither horizontal spillovers from -- nor strong and vibrant vertical supplier relationships to -- the vast FDI presence in China have yet taken place in any dramatic way, and difficult and complicated reforms are likely to be required before they do. These reforms include improving the doing-business climate for private Chinese domestic firms, submitting state-owned enterprises to competitive market forces, upgrading worker skills, creating engineering and managerial talent, reforming financial institutions, and improving infrastructure.

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[4] Steven Pearlstein. 2011. "China is following the same old script – the one that gives it all the best lines." *The Washington Post*, p. A-11. January 19, 2011.

[5] Nicholas R. Lardy. 2002. *Integrating China into the Global Economy*. Washington, DC: The Brookings Institution. Table 2-2, p. 38, and footnote 43.

[6] Robert Koopman, Zhi Wang, Shang-Jin Wei. 2008. How Much of Chinese Exports is Really Made in China? Assessing Domestic Value-Added when Processing Trade is Pervasive. *Op. cit*.

Across the expanse of the Chinese domestic economy, the accumulated evidence simply does not show FDI to be a powerful source for indigenous-controlled industrial transformation. In the case of exports, the production of increasingly sophisticated goods destined for international markets from China has been remarkably well constrained to and contained within the plants owned and controlled by foreign multinationals and their international suppliers. China has remained a low value-added assembler of more sophisticated inputs imported from abroad – a "workbench" economy largely bereft of the magnified benefits and externalities from FDI enjoyed by other developing countries.

II. Manufacturing Multinationals and Technology Capture in Headline Industries

Recent controversy about policies clustered under the rubric of "indigenous innovation" is only the most recent manifestation of Beijing's determination to use the lure of participation in the rapidly growing Chinese market – whether as a base for domestic sales or as a site for exports – to pressure foreign manufacturing multinationals to transfer industry best practices to Chinese partners and other Chinese firms in certain target industries.

In *high speed railroad transport*, the State Council, Ministry of Railroads, and state-owned train builders (China North Car (CNR) and China South Car (CSR), have been particularly successful in combining access to the Chinese domestic market, favorable financing, and competition among foreign investors to induce transfer of technology and production processes to Chinese national champions. In 2004, the Ministry of Railroads solicited bids to produce train sets that could reach 200 km/h. Alstom of France, Bombardier Transportation's German subsidiary, Siemens of Germany, and a Japanese consortium led by Kawasaki submitted bids, with all except Siemens winning part of the contract. Alstom teamed up with CNR's Changchun Railways Vehicles, while the Kawasaki-led consortium joined with CSR's Sifang Locomotive & Rolling Stock. The following year, Siemens won a contract to supply technology and build trains with CNR's Tangshan Railway Vehicle Company. The same strategy was success in transferring technology and production experience for key components. CSR Zhuzhou Electric obtained traction motor know-how from Mitsubishi Electronic. Yongji Electric obtained traction motor know-how from Alstom and Siemens.

In less than four years of "digestion", CSR mastered and improved what it received from Kawasaki, finally cancelling its cooperation agreement. According to Zhang Chenghong, the president of CSR , CSR "made the bold move of forming a systemic development platform for high-speed locomotives and further upgrading its design and manufacturing technology. Later,

we began to independently develop high-speed CRH trains with a maximum velocity of 300-350 kilometers per hour, which eventually rolled off the production line in December 2007."[7]

Siemens and Bombardier remained active in China by signing a "cooperation agreement on joint action plan for the independent innovation of high-speed trains in China" with the Chinese Ministry of Science and Chinese Ministry of Railway to develop and build a new generation of trains with a top operations speed approaching 400 km/h, which came into service in late 2010.

On the basis of expertise acquired from joint ventures with MNCs in the Chinese market, Chinese firms have gone multinational themselves, either alone or alongside their international partners. Acting on their own, Chinese train-makers and railroad construction companies have signed agreements to build high speed railroad systems in Turkey, Venezuela, and Argentina, while bidding on high speed rail projects in Russia, Brazil (Sao Paulo to Rio de Janeiro), and the United States (Los Angeles to San Francisco). Teaming up with multinational allies first met in the home market, China Railway Construction Corporation joined with Alstom of France to win Phase I of the Mecca to Medina high speed rail line, while CSR has partnered with Siemens to bid on Phase II.

In *aerospace,* China similarly uses access to the Chinese market plus an informal "offset" policy to gain access to aviation technology and production expertise. Early in 2005, for example, China approached Airbus seeking an Airbus final assembly line to be built in China, and later in the same year signed a purchase order to import 150 Airbus A320s, worth approximately $10 billion.[8] Eighteen months Airbus later set up a joint venture company to assemble the A320 in Tianjin, and an Airbus spokesman acknowledged a quid pro quo.[9] In 2009, the Airbus affiliate delivered the first mid-sized commercial airliner fully made in China.

For Boeing – as for Airbus – China's offset negotiations appear to have pushed the output from made-in-China requirements into international markets. While it is difficult to verify exactly what is involved in offset agreements because they are private agreements between purchaser and supplier, Boeing's website affirms that "Boeing is please to have been invited to help Chinese companies develop skills, achieve certification, and join world aviation and supplier networks….China builds horizontal stabilizers, vertical fins, the aft tail section, doors, wing panels and other parts on the 737; 747 trailing edge wing ribs; and 747-8 ailerons, spoilers and inboard flaps. China also has an important role on the new 787 Dreamliner airplane, building the rudder, wing-to-body fairing panels, leading edge and panels for the vertical fin, and other composite parts." On its Web site, Airbus reports that over half of its fleet worldwide contains components produced by Chinese companies.

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[7] Chen Biao and Zhu Huijue. "Era of 'Created in China' – an interview with CSR President Zheng Changhong." China Pictorial online. May 10, 2010.

[8] *Report to Congress of the US-China Economic and Security Review Commission* 2010. Washington DC: US Government Printing Office, p. 99.

[9] *Ibid.*, p. 100.

As in high speed rail transport, international component companies have competed fiercely to supply inputs to Commercial Aircraft Corporation of China's C919 project which is designed to carry up to 200 passengers and compete directly with Boeing 737s and Airbus 320s.[10] The roster of US suppliers to the C919 includes Rockwell Collins, Honeywell, Hamilton Sundstrand, Parker Aerospace, Eaton Corporation, Kidde Aerospace, and General Electric. GE's joint venture with Aviation Industry Corporation of China (AVIC) in Shanghai will focus on domestic production of the electronics for communication, navigation, cockpit displays, and controls that constitute the constitute the avionics avionics "brain" for the new 787 Dreamliner of Boeing. "Doing business in China," opine David Barboza, Christopher Drew and Steve Lohr, "often requires Western multinationals like GE to share technology and trade secrets that might eventually enable Chinese companies to beat them at their own game – by making the same products cheaper, if not better."[11]

"What's good for GE or Honeywell or Rockwell is," claims Steven Pearlstein, "in this case, almost certainly not good for America and American workers." [12]

If the use of industrial policy to force technology transfer from foreign firms to indigenous companies is straightforward in high speed rail and aerospace, the results were initially quite counterproductive in the *automotive sector*. [13] Under the label of market-for-technology, Chinese policies from the 1980s into the 1990s offered foreign investors access to a high protected Chinese market in return for partnering with indigenous firms and promising to meet high domestic content requirements. Fearful of losing control over their intellectual property – as when the Chinese partner in the Audi-First Automobile Works "expropriated" the production technology after Audi's license expired in 1997 – international companies hesitated to introduce their most advanced technology into Chinese JV plants, and employed assembly processes that lagged world standards by almost ten years. After accession to the WTO, steady (albeit sometimes grudging) liberalization of the domestic market and rapid growth in internal demand allowed the major international auto companies to achieve economies of scale, rationalize production, and reach out to indigenous suppliers who themselves are able to enjoy full economies of scale. Help from foreign automotive investors in meeting the more stringent quality, safety, and anti-pollution standards may allow for expanding export opportunities to Europe and North America.

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[10] David Barboza, Christopher Drew and Steve Lohr. 2011. "GE to Share Jet Technology With China in New Joint Venture". The New York Times. January 17.

[11] *Ibid*.

[12] Steven Pearlstein. 2011. "China is following the same old script – the one that gives it all the best lines." *The Washington Post*, p. A-11. January 19, 2011.

[13] Guoqiang Long. 2005. "China's Policies on FDI: Review and Evaluation". In Theodore *H.* Moran, Edward M. Graham, and Magnus Blomstrom, eds. *Does Foreign Direct Investment Promote Development*. Washington, DC: Peterson Institute for International Economics, 2005).

III. Manufacturing FDI in China and the Increasing Sophistication of Chinese Exports: Behind the Headlines

Turning from sectoral case studies to aggregate data, there is no other way to describe the impact of foreign manufacturing investment in China except as massive. In 2003 China overtook the United States as the largest destination for foreign investment in the world, and then settled into second place. FDI inflows reached $168 billion in 2008, declining slightly to $143 billion in 2009.[14]

Multinational corporations in manufacturing have been the force that has propelled China's exports from low skill-intensive to high skill-intensive products. In 1992, the low skill-intensive sectors in China accounted for 55 percent of China's exports.[15] By 2005 these same low skill-intensive sectors' share had fallen to 33 percent. The composition of exports had shifted from a predominance of agriculture, apparel, textiles, footwear, and toys into machinery and transport products. Here the strongest export growth has been machinery, and within this broad classification telecom equipment, electrical machinery, and office machines constitute the largest shares. These more sophisticated sectors are dominated by processing trade, an arrangement in which imports are allowed into the country duty free where they are assembled for export. Processing trade exports of machinery and electrical products grew from $9 billion in 1992 to $323 billion in 2006, from 22% to 63% of all exports. Processing trade, in turn, is dominated by foreign multinationals (called foreign-invested firms or FIES, including both joint venture and wholly-owned affiliates of foreign multinationals), especially for more sophisticated products. The build-up of the foreign presence has been nothing short of remarkable.[16] In 1992, foreign multinationals accounted for 5% of exports in ordinary trade and 45% of processing exports. By 2006, foreign multinationals account for 28% of ordinary exports, but 84 % of processing exports. So today foreign multinational occupy a predominant place in processing trade, while maintaining a substantial presence in ordinary trade, too.

The share of processing trade – and the foreign firm share of exports -- climbs rapidly as the skill-intensity of the products increases.[17] For wearing apparel, processing exports as a share of industry exports in 2002 was 45.1 percent, with foreign firms accounting for 39.2 percent of

[14] UNCTAD. *World Investment Report 2010*. Annex Table 1.

[15] Mary Amiti and Caroline Freund. 2010. "What Accounts for the Rising Sophistication of Chinese Exports?" in Robert C. Feenstra and Shang-Jin Wei, eds., *China's Growing Role in World Trade.* Chicago: University of Chicago Press for the NBER.

[16] Robert C. Feenstra and Shang-Jin Wei. 2010. "Introduction" *Ibid.*

[17] Robert Koopman, Zhi Wang, Shang-Jin Wei. 2008. How Much of Chinese Exports is Really Made in China? Assessing Domestic Value-Added when Processing Trade is Pervasive. NBER Working Paper 14109.

industry exports. For household electrical appliances, processing exports as a share of industry exports was 79.1 percent, with foreign firms accounting for 56.9 percent of industry exports. For electronic devices, processing exports as a share of industry exports was 89.7 percent, with foreign firms accounting for 87.5 percent of industry exports. For telecommunications equipment, processing exports as a share of industry exports was 91.2 percent, with foreign firms accounting for 88.4 percent of industry exports. For computers, processing exports as a share of industry exports was 99.1 percent, with foreign firms accounting for 99.4 percent of industry exports.

So foreign manufacturing multinationals have been responsible for changing the composition of China's exports, but it is almost exclusively the foreign firms who are producing the more sophisticated exports.

The importance of this observation comes into clearer focus when examining China's growing presence in export of what are classified as "Advanced Technology Products".

The headline industry cases examined in the previous section, combined with China's rapid growth in Advanced Technology Products (ATP) to developed countries – leading, for example, to a Chinese surplus in ATP goods in China-US bilateral trade -- leads to speculation that China might be "leapfrogging" ahead technologically.[18]

But Who-Is-Us? that have been engaging in Advanced Technology Exports from China?

Foreign manufacturing investors have been responsible for more than 92 percent of all Chinese ATP exports since 1996, and 96 percent since 2002. And within this 96 percent foreign investor-dominated channel, there has been a shift to wholly-owned MNC exporters from joint venture companies. State-owned Chinese enterprises have an ATP trade deficit with the US, while private Chinese firms and collective enterprises contribute very little to ATP trade.

And What-Is-Us? when the composition of Chinese Advanced Technology Exports and Imports comes under scrutiny?

The data show that there is a sizable technological gap between Chinese ATP imports and Chinese ATP exports. Chinese ATP imports from the United States consist of large-scale, sophisticated, high-valued equipment and devices, whereas ATP exports to the United States are small-scale products or components in the low-end of the ATP value-added chain.[19] Some 40 percent of the unit value ratios between US-exported ATP products and China-exported ATP

[18] Michael Ferrantino, Robert Koopman, Zhi Wang, Falan Yiung, Ling Chen, Fengjie Que, Haifend Wang. 2010. "Classification and Statistical Reconciliation of Trade in Advanced Technology Products: The Case of China and the United States" Joint Working Paper on US-China Trade in Advanced Technology Products. US International Trade Commission.

[19] *Ibid.*

products falls between 1 and 10 times greater for the US ATP exports to China, one-third falls between 10 and 100 times greater for the US ATP exports to China, and more than 13 percent are at least 100 times greater for the US ATP exports to China. In some categories, China simultaneously imports and exports the same product – for example, microscopes – but the types imported from the US cost ten to twenty times more than the types exported to the US, suggesting a sizable difference in features and capabilities.

I. Domestic Content and Value-Added in China on the Part of Foreign Multinational Exporters: A Comparative Perspective

In processing trade where foreign investors are heavily represented, Nicholas Lardy shows that the import content of processing trade exports has steadily declined, overall, meaning that the domestic content and value-added in China have been on the rise.[20] In the first half of the 1990s the import content of processing trade exports was approximately 80 percent (domestic content 20 percent); by the late 1990s, it was around 65 percent (domestic content 35 percent). By 2007, the import content of processing trade exports was 60 percent, with domestic content 40 percent.

But Robert Koopman, Zhi Wang, and Shang-Jin Wei find that the decline in the import content is concentrated at the low-skill intensive sectors of processing trade exports. [21] As the skill-intensity of exports increases, the percentage of the value of the final product that derives from imported components rises sharply. For wearing apparel, the percentage of the value of the final product that derives from imported components is 62.4 percent. For household electrical appliances, the percentage of the value of the final product that derives from imported components is 76.3 percent. For electronic devices, the percentage of the value of the final product that derives from imported components is 85.2 percent. For telecommunications equipment, the percentage of the value of the final product that derives from imported components is 91.6 percent. For computers, the percentage of the value of the final product that derives from imported components is 96.1 percent.

Greg Linden, Kenneth L, Kraemer, and Jason Dedrick provide a fascinating look at who captures value in advanced electronics products exported from China, and where those who capture value are located. [22] Value-capture means the margin for the firm after paying for inputs and labor.

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[20] Nicholas R. Lardy. 2002. *Integrating China into the Global Economy*. Washington, DC: The Brookings Institution. Table 2-2, p. 38, and footnote 43.

[21] Robert Koopman, Zhi Wang, Shang-Jin Wei. 2008. How Much of Chinese Exports is Really Made in China? Assessing Domestic Value-Added when Processing Trade is Pervasive. *Op. cit*.

[22] Greg Linden, Kenneth L, Kraemer, Jason Dedrick. 2007. "Who Captures Value in a Global Innovation System? The case of Apple's iPod" Working paper. Personal Computing Industry Center, University of California, Irvine, June.

Their target is Apple's iPod assembled in China with a retail price of $299 in 2005. In their estimation by far the most costly input in the iPod is the 30GB hard drive from Toshiba, which costs $73 or more than 50% of the total input cost, with a margin for Toshiba of about $20, which they assign to Japan. The second-most valuable input is the display, with a factory price of $20, plus margin of $6 for Toshiba-Matsushita, which they again assign to Japan. Next are two microchips from US companies, Broadcom and PortalPlayer, leading to $7 in margin assigned to the US. The SDRAM Memory comes from Samsung, with $0.67 assigned to Korea. There are more than 400 additional inputs, with values from $4 to fractions of a penny. Apple's gross profit meanwhile is $80, or $155 if distributed through Apple's own retail outlet. The margins for the companies involved in the creation of the iPod (above costs of materials and labor) total $190: $163 accrue to the US, $26 to Japan, $1 to Korea, if the iPod is sold in the US. Some portion of $75 allocated to retail and distribution would go to other players if the iPod were sold outside the US.

Linden, Kraemer, and Dedrick conclude that "the value added to the product through assembly in China is probably a few dollars at most" (the popularly accepted figure is $4). They argue that while Apple's margins are high within the electronics sector, the "geography" of value-capture for the iPod is fairly representative for the industry.[23] Robert Koopman, Shi Wang, and Shang-Jin Wei support this contention with their finding that Japan, the United States, and Europe (EU15) are the main sources of foreign content for computers and electronics in China, accounting for about 60% of imported components.[24]

In 2010, Yuqing Xing and Neal Detert undertook a similar calculation of the value-capture in China in assembly of Apple's iPhone.[25] They find that the value-added in China in 2009 for the iPhone was $6.50 per unit, which was 3.6 percent of the total shipping price of the phone.

At the end of the day, China's high tech export explosion represents multinational corporations bringing high skill-content high value-added inputs into China, assembling them into final products (or semi-assembled intermediates), and exporting them to world markets.[26]

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[23] *Ibid.*, p. 10

[24] Robert Koopman, Shi Wang, and Shang-Jin Wei . 2009. "A World Factory in Global Production Chains. Estimating Imported Value-Added in Chinese Exports", UK: Center for Economic Policy Research, Discussion Paper 7430, September.

[25] Yuquing Xing and Neal Detert. 2010. "How the iPhone Widens the United States Trade Deficit with the People's Republic of China" Tokyo, Japan: Asian Development Bank Institute. ADBI Working Paper Series, No. 257. December.

[26] Lee Branstetter and Fritz Foley note that US MNCs export very little of what they produce in China back to the US. Stephen Yeaple amends this to point out that US MNC exports to other countries in the region, perhaps for integration into final products elsewhere, is growing rapidly. Lee Branstetter and C. Fritz Foley. 2010. "Facts and Fallacies about US FDI in China (with

Other comparative analytics substantiate the modest outcome China has achieved in using foreign multinationals to upgrade the indigenous industrial base. From a comparative perspective, the share of domestic value-added in FDI operations in China in high skill-intensive sectors such as computers and telecommunications, for example, ranges from *less than one-half to slightly more than one-half* of what is found in other developing countries where comparable measurements can be made, such as Mexico.

This comparative evidence comes from Justino de la Cruz, Robert B. Koopman, Zhi Wang, and Shang-Jin Wei who are able to compare the outcome of manufacturing FDI in China rigorously to other developing countries where there are similar processing-trade regimes.[27] The most accurate comparison can be made with Mexico where the maquiladora and PITEX (Program of Temporary Imports to Produce Export Goods) structures resemble China's processing-trade system.

In low-skill intensive industries – such as apparel – the FDI-dominated processing industries show a relatively large share of domestic value added in both countries: a 35.4% share for Mexico, a 37.6% share for China.

In the middle-skill intensive automotive sector, the FDI-dominated processing industries show what De La Cruz, Koopman, Wang, and Wei characterize as "medium" domestic value added in both countries: a 35.2% share in motor vehicles and 23.9% share in auto parts for Mexico, a 33.8% share in motor vehicles and a 28.7% share in auto parts for China – although Mexico scores a much higher 43.8% domestic value added share in "other transportation equipment" (for which there is no comparable category in the authors' data for China). For China, Nicholas Lardy notes that for some vehicle lines the domestic content has been climbing over time: the popular Santana, produced by a joint venture between Volkswagen and Shanghai Automotive, was launched in 1985 with a domestic content of 2 percent but recorded domestic content well

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Apologies to Rob Feenstra)". Stephen Yeaple. "Comment" in Robert C. Feenstra and Shang-Jin Wei, eds., *China's Growing Role in World Trade.* Chicago: University of Chicago Press for the NBER.

[27]Robert Koopman, Zhi Wang, Shang-Jin Wei. 2008. How Much of Chinese Exports is Really Made in China? Assessing Domestic Value-Added when Processing Trade is Pervasive. NBER Working Paper 14109. Table 5. Justino de la Cruz, Robert B. Koopman, Zhi Wang, and Shang-Jin Wei. 2010. "Estimating Foreign Value-Added in Mexico's Manufacturing Exports". Working paper. Tables 7and 8. Justino de la Cruz, Robert B. Koopman, Zhi Wang, and Shang-Jin Wei.2009. "Domestic and Foreign Value-added in Mexico's Manufacturing Exports, power points, May 9.

over 90 percent by the late 1990s.[28] Other large volume production vehicles, such as the Buicks produced by GM and Shanghai Automotive, followed a similar track.

For high skill-intensive sectors, such as computers and telecommunications equipment, both countries have a much lower share of domestic value added in the FDI-dominated processing sectors. But, as noted above, Mexico's small domestic value added share (8.5% share in computers, 14.9% share in telecommunications) is nonetheless almost twice as large to well more than twice as large as the shares for these industries in China (3.4% share in computers, 8.4% share in telecommunications).

Turning from measurement of domestic content within foreign-owned factories to measurement of impact from FDI on surrounding firms within China, econometric assessments of horizontal and vertical spillovers from multinational investors to indigenous Chinese firms (private or state-owned) appear to be relatively weak in comparison to other countries in Asia, as do export externalities. The reasons include lower pay at Chinese companies and brain-drain from them to foreign MNCs, gaps in technology and quality-control standards, adaptability limitations, and intercultural communication problems.

Bruce Blonigan and Alyson Ma investigate the extent to which Chinese domestic firms are "keeping up" or even "catching up" with foreign exporters.[29] They do not try to measure spillovers directly. Instead, they compare the volume, composition, and quality of exports of the two groups. They find that the general pattern over the time period, 1997-2005, runs exactly counter to what one would expect if Chinese firms were catching up – foreign firm's share of exports by product category and foreign unit values relative to Chinese unit values are increasing over time, not decreasing. *Chinese exporters are not even "keeping up" let alone "catching up" with foreign multinational investors in China.*

To deepen the impact of foreign investment on the indigenous economic base in China – expanding the linkages from international investors and deriving more spillovers from their presence – will require improving the doing-business climate for private Chinese domestic firms, submitting state-owned enterprises to competitive market forces, upgrading worker skills, creating engineering and managerial talent, reforming financial institutions, and improving infrastructure. Many of these reforms are underway, to a greater or lesser extent. So positive contributions from foreign manufacturing multinationals to the indigenous Chinese economy -- beyond the 13-14 million workers directly employed in foreign MNC plants -- are likely to

[28] Personal communication, November, 2010.

[29]Bruce A. Blonigen and Alyson C. Ma. 2010. "Please Pass the Catch-Up: The Relative Performance of Chinese and Foreign Firms in Chinese Exports" in Robert C. Feenstra and Shang-Jin Wei, eds., *China's Growing Role in World Trade.* Chicago: University of Chicago Press for the NBER.

increase over time. Thus far, however, the aggregate data simply do not show FDI to be a powerful source for indigenous-controlled industrial transformation in China.[30]

Where do the gains from FDI in China end up?

In their dissection of the "value-capture flows" for Apple's iPod -- that demonstrates no more than $4 of the final sales price of $299 (2005) remains in China -- Greg Linden, Kenneth L. Kraemer, and Jason Dedrick suggest that the value-added attributed to the parent company that contributes a component or performs an integrative function to a product in China flows directly back to MNC headquarters. This is almost surely too simplistic -- especially for US MNCs -- given the American territorial tax system with the foreign tax credit and deferral that encourage US MNCs to use transfer pricing to keep accumulations of earnings offshore.

Rather than try to track down capital flows and hiding places within integrated MNC networks, the more sensible approach is to ask a slightly different kind of question: *if MNC headquarters use earnings from China, like earnings from elsewhere, to fortify their corporate position in world markets, what kinds of activities will those earnings help maintain or expand, and where will they be located?*

In coming to an answer for this question, it is striking to note -- even in today's globalized world – how remarkably home-based MNCs from developed countries have remained.

For the United States the most recent data show that US-headquartered MNCs have 70 percent of their operations, make 89 percent of their purchases, spend 87 percent of their R&D dollars, and locate more than half of their workforce within the US economy This predominant focus on the home economy has persisted over time, and changes only very, very slowly at the margin.

The home-market-centered orientation for MNCs across the developed world is not dissimilar.

Thus, while manufacturing MNCs may build plants in China -- or shift production to Vietnam, outsource to Mexico, take a chance in Costa Rica or the Czech Republic, develop a new application in Israel -- the largest impact from deployment of worldwide earnings is to bolster their operations in their home markets.

[30]Lee Branstetter and Fritz Foley note that US MNCs actually do relatively little R&D in China (three tenths of one percent of their worldwide R&D and less than 13 percent of their R&D performed in the Asia-Pacific region), and most of R&D activity in China appears to consist of customizing innovations discovered elsewhere for the Chinese market. Lee Branstetter and C. Fritz Foley. 2010. "Facts and Fallacies about US FDI in China (with Apologies to Rob Feenstra)" in Robert C. Feenstra and Shang-Jin Wei, eds., *China's Growing Role in World Trade, op. cit.*