Production Offshoring and Labor Markets: Recent Evidence and a Research Agenda

Margaret S. McMillan

Tufts University and NBER

This Draft: June 10, 2009

This note reviews the evidence on the labor market effects of production offshoring for developed and developing countries, highlighting the outstanding issues. Production offshoring involves the relocation of physical manufacturing processes outside a country's borders. Examples of production offshoring include the manufacturing of electronic components by Intel in Costa Rica or the production of personal computers by Lenovo in Vietnam. Although services offshoring is a growing phenomenon, its relative importance for determining labor market outcomes is likely to be limited. Services offshoring to China and India account for a tiny fraction of aggregate US activity in services; in contrast, offshoring accounts for a substantial share of US manufacturing activity.

We begin this note with a review of the theoretical models of offshoring. Next, we review the empirical evidence for developed countries drawing heavily on studies done for the United States. While these studies focus primarily on the impact of offshoring on domestic labor markets, there are some important insights to be gleaned from these studies regarding labor markets in developing countries. For example, Brainard and Riker (1997) find evidence consistent with the notion of a "race to the bottom". We then turn to the evidence for developing countries. To date, almost all of the evidence for developing countries is based on single country studies that examine the effect of foreign direct investment by developed countries on labor market outcomes in developing countries.

The final section of this note summarizes the existing evidence and outlines a research agenda. In particular, we identify the following questions as deserving of more attention: (1) Does offshoring increase income volatility? (2) Does offshoring increase wage inequality? (3) How substantial are the wage and employment effects of offshoring? (4) What are the general equilibrium effects of offshoring? (5) What are the implications of offshoring by China?

Offshoring and Domestic Labor Markets: The Theory

The theoretical literature on the linkages between multinational activity, labor demand, and wages does not yield clear predictions on the relationship between offshore activities and home labor market outcomes. For example, in the Helpman (1984) model, the motivation for foreign investment is based on factor price differences which exist outside of the endowment allocation in the presence of factor price equalization. Consequently, in that alternative equilibrium, factor price differences follow from different relative endowments, and foreign investors will be drawn to countries where they could pay (for example) lower wages for a homogeneous type of good. Such a framework implies that, under some initial relative endowments, offshoring for vertically oriented multinationals can be associated with intra-firm imports of low-wage goods, largely invisible exports from headquarters of intangibles such as management skills, falling domestic demand for unskilled labor, and falling domestic wages.

In stark contrast, Grossman and Rossi-Hansberg (2006) show that offshoring tasks can confer a productivity gain that can boost domestic wages. Grossman and Rossi-Hansberg draw on insights from Autor, Levy, and Murnane (2002) to develop a general equilibrium framework in which falling costs of offshoring can lead to wage gains for both skilled and unskilled workers at home. Grossman and Rossi-Hansberg use Autor, Levy and Murnane's differentiation between routine and non-routine tasks to build a theoretical model of trade in tasks. Advances in technology (such as improvements in communication) make offshoring of routine tasks less costly, leading firms to increase production abroad. What is surprising is that offshoring of routine tasks for vertically motivated multinationals (there is no horizontal motive for foreign investment here) leads to ambiguous predictions for domestic wages. The intuition behind this result is that falling costs of offshoring act like a positive productivity shock. Although the primary motivation for offshoring is to save labor costs, low-skill workers at home may still gain if terms of trade effects and labor supply

effects (offshoring acts like an increase in the labor supply, which puts downward pressure on domestic wages) are not too large.

Other general equilibrium models of offshoring also predict benefits from offshoring for domestic workers. For example, Mitra and Ranjan (2007) study the effects of offshoring on unemployment to show that the general equilibrium effects of offshoring can be paradoxical and quite beneficial for domestic workers. In contrast, Antras, Garicano and Rossi-Hansberg (2006) employ a matching model with heterogeneous workers to show that offshoring increases wage inequality in poor countries. Spencer (2005) provides a survey of the theoretical work on offshoring.

A separate but related strand of literature considers the impact of offshoring on income volatility. For example, Rodrik (1997) points out that globalization can increase the elasticity of demand for labor, thereby increasing wage volatility. Bermin, Hanson and Feenstra (2009) show that offshoring by the US to Mexico can (and indeed has) increase income volatility in Mexico, while Karabay and McLaren (2009) show that offshoring increases the volatility of the wages of domestic workers.

Horizontal foreign direct investment has been largely left out of the most recent discussions about offshoring. Yet, most of FDI is still primarily market-seeking and not necessarily part of an international production network. There is currently no agreement in theoretical literature on whether horizontally integrated foreign investment ("H-FDI") or vertically integrated foreign investment ("V-FDI") is more likely to lead to domestic job losses. An early version of the V-FDI model is presented in Helpman (1984). In the Helpman (1984) model, the motivation for foreign investment is based on factor price differences which exist outside of the endowment allocation where there is factor price equalization. Consequently, in that alternative equilibrium, factor price differences follow from different relative endowments, and foreign investors will be drawn to countries where they could pay (for example) lower wages for a homogeneous type of good.

In the Helpman (1984) framework, there is an equilibrium where the parent ("headquarters") imports low-wage goods and exports headquarter services. In such a world, domestic demand for labor to produce the homogeneous good in the headquarters country would fall and wages would continue to decline until factor price equalization is eventually achieved. Such a framework implies that, under some initial relative endowments, V-FDI can be associated with intra-firm imports of low-wage goods, largely invisible exports from headquarters of intangibles such as management skills and knowledge arising from product specific R and D conducted at home, falling domestic demand for unskilled labor, and falling domestic wages.

Other approaches, however, suggest that V-FDI could be associated with rising labor demand at home. In Markusen (1989), domestic and foreign specialized inputs are complements by design, and trade generates welfare gains by increasing the number of specialized inputs available (which are produced under increasing returns to scale technology). There are also models which focus on the implications for labor demand of V-FDI versus H-FDI. Markusen and Maskus (2001) show how different incentives for foreign investment lead to different organizational structures, which in turn should produce different degrees of substitution between employment at home and abroad. Horizontal multinationals, which are defined as firms which produce the same products in different locations, are primarily motivated by trade costs to locate abroad.[1] For H-FDI, investment abroad substitutes for parent exports and foreign affiliate employment should substitute for home employment. In their framework, V-FDI leads to complementarity between trade and foreign investment. Vertically-integrated enterprises are motivated by factor endowment differences (and consequently factor price differences in a world where there is no factor price equalization) to locate different components of production in different locations. As pointed out by Brainard and Riker (1997), one implication of this type of modeling approach would be that parent and affiliate employment would be complementary.

[1] For the purpose of simplicity, we will occasionally refer to horizontally-integrated firms as horizontal firms, and vertically-integrated firms as vertical.

To summarize, both the literature on offshoring and the literature on trade and foreign direct investment come to the same conclusion: the impact of these different forms of doing business on host country employment and wages are theoretically ambiguous. On the other hand, it is typically assumed that recipient countries benefit from these sorts of transactions both in terms of jobs and higher wages. There appears to be no theoretical work on the impact of offshoring by developing countries on host or recipient country labor markets. According to Sachs (2009), the economies of China and India are not dual as in Lewis (1954; haven't referenced this) but rather triple economies. The three sectors are: high-tech world class R&D, low-tech standardized mass production of a lot of manufacturing, and hundreds of millions of poor people in the countryside. Sachs argues that the complexity of these markets warrant a new set of models.

Offshoring and Domestic Labor Markets: The Evidence for Developed Countries

The evidence on offshoring and domestic employment is decidedly mixed. Brainard and Riker (1997) showed that employment across high and low wage affiliate locations of US multinationals is complementary for manufacturing activities. Borga (2005), Desai, Foley, and Hines (2005), and Slaughter (2003) also find that expansion of US multinationals abroad *stimulates* job growth at home. Slaughter (2003) reports the largest positive effects of offshoring: for every new job created abroad, US employment increases two-fold.[2] Reviewing these studies, Mankiw and Swagel (2006) conclude that "foreign activity does not crowd out domestic activity; the reverse is true."

Another set of studies on this topic (Brainard and Riker (2001), Hanson, Mataloni and Slaughter (2003), Muendler and Becker (2006), Harrison and McMillan (2007), and Harrison, McMillan, and Null (2007)) reaches the opposite conclusion: jobs abroad *do replace* jobs at home, but the effect is small. Moreover, Brainard and Riker (2001) use a factor demand approach to show that labor employed by affiliates overseas substitutes at the margins for labor employed by parents at

[2] Slaughter's estimates are presented in a recent high profile report released by the government on the consequences of offshoring for the US economy.

home, but they emphasize that the results differ depending on geographic location. In particular, they emphasize that there is strong substitution between workers at affiliates in developing countries, with workers in countries like Mexico and China competing for the same jobs. Borga (2005) and Desai, Foley, and Hines (2009) ask a different set of questions. Desai, Foley, and Hines (2009) focus on the correlation between expansion in activity at home and abroad. They show that there is a positive association between growth in domestic investment, assets, employment, and total compensation for multinational parents and their foreign affiliates.

Second, previous studies have used a variety of different methods. While Desai, Foley, and Hines (2009) adopt an instrumental variable approach to estimate the association between growth in employment at home and abroad for US multinationals, Muendler and Becker (2006) and Brainard and Riker (1997) estimate translog factor share equations. Using German multinational data, Muendler and Becker (2006) also explore the importance of selection into affiliate locations for the consistency of their estimates.

Third, previous empirical studies on employment and offshoring have not distinguished between the different motivations for foreign investment. As noted above, the motivation for offshoring has important implications for labor. Harrison and McMillan (2009) develop an empirical framework which is flexible enough to allow substitution or complementarity between home and affiliate employment for firms that have different motivations to engage in foreign activities. With this framework, they identify the separate effects of horizontal versus vertical foreign investment on home employment, and also allow for different degrees of substitution (or complementarity) in high- and low-income affiliate locations. To address the possibility that methodological differences might be driving the conflicting results described above, they adopt a variety of different approaches to estimating labor demand and a range of econometric techniques.

They find that the insights derived from trade theory go a long way towards explaining the apparently contradictory evidence on the relationship between offshoring and domestic

manufacturing employment. For US parents primarily involved in horizontal activities, affiliate activity abroad substitutes for domestic employment. For vertically-integrated parents, however, the results suggest that home and foreign employment are complementary. Foreign wage reductions are associated with an increase in domestic employment. The results differ across high- and low-income affiliate locations, in part because factor-price differences relative to the US are much more important in low-income regions. In low income affiliate locations, a 10 percentage point reduction in wages is associated with 2.7 percent point reduction in US parent employment for horizontal parents and a 3.1 percentage point increase in parent employment for vertical firms.

They also show that offshoring is not the primary driver of declining domestic employment of US manufacturing multinationals between 1977 and 1999. In fact, the evidence suggests that operating in low-income affiliate locations preserves jobs (for vertically integrated parents), instead of destroying them. They show that declining domestic employment of US multinationals is primarily due to falling prices of investment goods (such as computers, which substitute for labor), falling prices of consumption goods, and increasing import competition. This research highlights both the importance of heterogeneous firm responses to opportunities for direct investment abroad and the need to account for other avenues through which international competition affects US labor demand.

Regardless of the reasons for discrepancies in results (see Harrison and McMillan (2009) for a discussion), all of the studies that analyze outcomes within firms registered with the Bureau of Economic Analysis share an important limitation. Since there are no details available on worker characteristics in these data, this research has been generally limited to exploring employment shifts between a US parent and its foreign affiliate.

There is a smaller but growing literature on offshoring and wages. Using data for the US manufacturing sector between 1979 and 1990, Feenstra and Hanson (1999) found that the real wages of production workers were probably unaffected by offshoring activities, while the real wages

of non-production workers increased by 1 to 2 percentage points. Feenstra and Hanson use a two-step procedure to first identify the impact of outsourcing and high technology investments on productivity and prices, and then trace through the induced productivity and price changes to production and non-production wages. Another study by Liu and Trefler (2008) finds that there are small or insignificant effects of offshoring on US wages. They measure the impact of services offshoring to China and India on labor outcomes of service sector employees.

What is most surprising about the growing literature on trade, offshoring, and wages is the lack of studies that use individual-level data to explore the linkages between manufacturing wages, offshoring, and international trade. Liu and Trefler (2008) are an exception, but focus purely on offshoring in the services sector to China and India. While they find no impact of services offshoring on wages, it is much more likely that there would be important consequences for US wages from increasing international trade, as well as offshoring of manufacturing activity. Services offshoring to China and India account for a very small fraction of aggregate US activity in services; in contrast, import competition as a share of sales in manufacturing has doubled in the last twenty years and offshoring has also increased significantly. In Feenstra's (2000) book exploring the impact of trade on wages, only one study uses individual level data to explore the linkages. That study by Lovely and Richardson (2000) relies on the PSID data and cannot identify significant effects of trade on US wages in part due to the fact that they follow a small sample of individuals over time.

In recent work, both Feenstra (2009) and Krugman (2008) suggest that the effects of trade and offshoring on US wages may be more important than these previous studies would suggest. Krugman challenges conventional wisdom by arguing that published research on trade and wages is largely outdated. He theorizes that the dramatic increase in manufactured imports from developing countries since the early 1990s could be responsible for the increase in wage inequality in the United States and other advanced countries. Feenstra (2008) in his Ohlin lectures writes that "my own

views have always favored a trade-based explanation [for the shift in labor demand toward more-skilled workers], and that the views of Krugman and others may be changing".

Ebenstein, Harrison, McMillan and Phillips (2009) examine *both* the impact of trade and offshoring on US labor market outcomes by combining information on wages and worker characteristics from the March Current Population Surveys (CPS) with data on trade and offshoring across industries over time. Their data on offshoring activities by US multinational firms comes from the Bureau of Economic Analysis and provides the only comprehensive coverage of the offshore activities of US firms. Their data on international trade includes both export shares and import penetration. Following Autor, Levy, and Murnane (2006), they also test whether the impact of offshoring or trade on US wages is more pronounced for occupations which can be characterized as routine. They also include a rich set of control variables; in particular, they control for total factor productivity growth and changing investment goods prices.

This paper represents an important break from previous papers by allowing both the effects of trade and offshoring to operate across sectors and within sectors. The standard approach to identifying effects of import competition or offshoring on wages is to use differences in import penetration across industries. This approach has been used to measure industry wage differentials, as well as to measure the effects of sector-specific import competition and offshoring on wages and employment. Their results confirm that wage effects due to either inter-industry differences in import competition or offshoring are not very significant. They find that the impact of offshoring on wages between 1982 and 2002 is also quantitatively small among those who *remain* in a specific manufacturing sector, consistent with the notion that inter-industry wage differentials are not large. For example, a 10% increase in offshoring to low-wage countries has virtually no impact on wages across all educational categories. A 10 percent increase in offshoring to high-wage countries is associated with an *increase* in wages for less educated workers of between 0.6 and 1 percent. In contrast, we find that workers who leave manufacturing lose on average 3 to 9 percent in real wages.

They also find small effects of offshoring on employment and only positive effects of offshoring on wages. Consistent with Harrison and McMillan (2006) and Harrison, Null, and McMillan (2007), they find that these small effects on employment depend on the location of offshore activities. A 10 percentage point increase in offshoring to low-wage countries reduces employment in manufacturing by 0.2% while offshoring to high-wage countries increases employment in manufacturing by 0.8 %.

While they find significant employment reallocation in response to import competition and smaller employment responses to offshoring, we find almost no industry-level wage effects. Yet inter-industry wage differentials may not be important in a fluid labor market such as the US market, where workers find it easy to relocate either to another manufacturing sector or are driven to leave manufacturing altogether. If most of the downward pressure on wages occurs in general equilibrium, whereby wages equilibrate across manufacturing sectors very quickly as workers relocate, then industry-level analyses miss the important effects of international trade on wages.

They address this problem by calculating an *occupation-specific* measure of offshoring, import competition, and export activity. If workers find it easy to relocate within manufacturing sectors or leave manufacturing altogether, but are more likely to remain in the same occupation when they switch jobs, then occupation-specific measures of international competition are more appropriate for capturing the effects of trade and offshoring on wages. Their results suggest that this is indeed the case, and that international trade has had large, significant effects on occupation-specific wages. These large wage effects are consistent with our results, showing significant reallocation of employment across industries in response to import competition. The downward pressure on wages due to import competition has been overlooked because it operates between and not within industries. Their results suggest that a one percentage point increase in occupation-specific import competition is associated with a 0.25 percentage point decline in real wages. While some occupations have experienced no increase in import competition (such as teachers), import

competition in some occupations (such as shoe manufacturing) has increased by as much as 40 percentage points.

Finally, a recent study by the OECD finds that offshoring may have contributed to a rise in the elasticity of labor demand in OECD countries. The study shows that the textiles industry, which is known for the relative importance of offshoring, has the most elastic labor demand. By contrast, the study shows that the elasticity of labor demand is low in most service industries where offshoring is less common.

Offshoring and Domestic Labor Markets: The Evidence for Developing Countries

Unlike the developed countries, most of the evidence concerning the impact of "offshoring" on developing country labor markets is centered on estimating the impact of developed country foreign direct investment on developing country labor markets. This is because the bulk of offshoring has been by developed countries. We begin this section by reviewing that evidence. We then turn to the indirect evidence regarding the impact of offshoring on developing country labor markets. Finally, we note that multinationals from developing countries are increasingly important players in the global economy and this trend is expected to accelerate as China and India continue to grow. More theoretical advances and empirical evidence will be required to understand the implications of offshoring by developing countries: we highlight these issues in the final section of this note.

In a chapter on trade and foreign direct investment for the forthcoming Handbook of Development Economics, Harrison and Rodriguez-Clare (2009) review the literature on the impact of FDI on factor markets in developing countries. They report that almost all studies find that workers in foreign firms are paid higher wages presumably because labor markets in developing countries are not perfectly competitive and because foreign firms tend to be more productive. Before controlling for firm and worker characteristics, the wage gap tends to be large. For example,

Martins and Esteves (2007) report a wage gap of 50 percent for Brazil, and Earle and Telegdy report a wage gap of 40 percent for Hungary.

However, when researchers control for firm and worker characteristics, the wage premium paid by foreign firms drops significantly. For example, Martins and Esteves (2007) follow workers who move to or leave foreign enterprises using a matched worker and firm panel data set for Brazil for the period 1995 through 1999. They find that workers moving from foreign to domestic firms typically take wage cuts , while those that move from domestic to foreign firms experience wage gains. However, the wage differences are relatively small ranging from 3 to 7 percent. The authors conclude that their results support a positive view of the role of foreign investment on labor market outcomes in Brazil.

Harrison and Rodriguez-Clare conclude that there is no evidence to support the view that foreign firms unfairly exploit foreign workers paying them below what their domestic counterparts would pay. Further evidence supporting this view comes from Harrison and Scorse (2008) who find evidence that foreign firms are more susceptible to pressure from labor advocacy groups, leading them to exhibit greater compliance with minimum wages and labor standards. They find that foreign firms in Indonesia were much more likely than domestic enterprises to raise wages and adhere to minimum wage requirements as a result of anti-sweatshop campaigns. They also find that the employment costs of anti-sweatshop campaigns were minimal as garment and footwear subcontractors were able to reduce profits to pay the additional wage costs without reducing the number of workers.

Harrison and Rodriguez-Clare do not consider the employment effects of FDI. This is not surprising since their chapter is primarily about trade, and most analyses of trade reform take as given the long-run level of employment. This 'exogenous employment' assumption, which asserts that in the long-run employment reverts to its initial level, has been criticized on the grounds that there are typically short to medium term adjustments that take place as a result of liberalization,

which can entail long spells of unemployment for displaced workers. However, according to Hoekman and Winters (2005), there is surprisingly little evidence on the nature and extent of transitional unemployment in developing countries.

Understanding the employment effects of offshoring for developing countries is particularly important since unemployment in many of these countries tends to be very high. Indeed, the promise of job creation is one of the reasons developing countries set up investment offices and provide all sorts of tax breaks to multinational corporations. Yet, we still know very little about the numbers and types of jobs created. The assumption is typically that jobs will be created and that this is a good thing. But this is not always the case. Take for example Chinese investors in Africa. Chinese construction projects in Africa are primarily carried out by state owned enterprises that typically employ imported Chinese workers. The lack of Africans employed in Chinese firms is causing increasing resentment in countries suffering from extreme poverty and high rates of unemployment (Ash 2007).

In an exception, Feenstra and Hanson (1997) consider the effects of relocating manufacturing activities from the U.S. to Mexico on the demand for labor in Mexico. For nine industries located across multiple regions in Mexico, they find that the demand for skilled labor is positively correlated with the change in the number of foreign affiliate assembly plants, and that FDI increases the wage share of skilled labor relative to unskilled labor. While this might seem counterintuitive, the reason for this is that tasks performed by unskilled labor in the US are performed by relatively skilled labor in Mexico. In a separate piece (Feenstra and Hanson, 2009), they find that offshoring by the US increases wage inequality in the US. They do not consider wage inequality in Mexico but the implications are clear. To the extent that offshoring increases the demand for skilled labor in Mexico, it would also increase inequality in Mexico. Feenstra indeed confirms this pattern in a recent lecture on globalization and labor (Feenstra, 2008).

In more recent work, Bergin, Feenstra and Hanson (2009) tackle the important issue of offshoring and job security. They argue that offshoring increases volatility because it allows the home country to export its business cycle fluctuations. They focus on Mexico's maquiladora sector which has displayed more volatility than the overall manufacturing sector in Mexico and any other industry in the U.S. They examine the apparel, electronic materials, machinery, and transport equipment sectors, which are Mexico's four main offshoring industries. By using a three-good model that includes a homogenous good exported by each country, as well as the offshored good, he finds that the standard deviation of Mexican employment, on average, is twice as high for each industry in the U.S. They then compare the Mexican industries to their counterparts in California and Texas to minimize potential size disparities that may explain the higher volatility. But even after correcting for size differences, they still find that the maquiladora industries are more volatile.

His theoretical model suggests that changes in employment by offshoring industries are driven partly by adjustment at the extensive margin. He uses employment data and the number of firms in the maquiladora industries to find evidence for the adjustment at the extensive margin. His estimates reveal that an increase in the share of aggregate employment in an offshoring industry results in over one third of adjustment at the extensive margin, demonstrating that plant entry and exit is an important means by which Mexico's offshoring industry adjusts to aggregate shocks. Providing further evidence for the adjustment at the extensive margin, he uses the Harmonized System import data for the U.S. to reveal a positive correlation between the number of distinct products crossing the border and U.S. manufacturing employment.

Unlike Berman, Bound and Machin (1998) who argue that productivity shocks are the primary source of international transmissions of business cycles, Feenstra finds that demand shocks are more important. Feenstra uses monthly government expenditure data in the U.S. and Mexico to calibrate demand shocks and monthly Solow residual data to calibrate supply shocks. His results indicate that home demand shocks are the most important driver of volatility in the Mexican

offshoring sector, while productivity shocks generate much less volatility in employment. He states that the fact that the maquiladora industries are more volatile reveals that the U.S. is exporting its cyclical fluctuations to Mexico's economy. This demonstrates that offshoring is important in explaining amplified volatility as firms rapidly shift production across borders.

Summarizing the Evidence and Outlining a Research Agenda

Offshoring's impact on labor markets in developed countries is a relatively new and growing area of research, spurred on by the combination of increased offshoring and job losses in the manufacturing sectors of developed countries. Until very recently, most of the evidence on offshoring indicated that the impact of offshoring on wages in developed countries was negligible. Similarly, a number of studies found that firms that offshore do so at the expense of domestic jobs but the extent of these effects so far seems to be negligible. Moreover, the counterfactual has not been adequately addressed: what would have happened to jobs and wages in the absence of offshoring? Recent work by Ebenstein, Harrison, McMillan and Phillips (2009) points out that part of the problem with past studies is that they all look for effects within manufacturing. They show that offshoring causes displacement of workers, leading to significant wage declines. They also show that offshoring has significant economy-wide effects on wages measured at the occupational level. They interpret this latter finding as evidence that workers are mobile across sectors but not across occupations.

By contrast, the impact of offshoring by developed countries on developing country labor markets has a long tradition in the literature. Most researchers find that foreign firms pay higher wages and conclude that FDI has beneficial effects on host country labor markets. However, the magnitude of these effects varies substantially. The employment effects of FDI in developing countries are less well understood. Recent work by Bergin, Feenstra and Hanson (2009) suggests

that these effects are important. Similarly, the impact of offshoring by developing countries on domestic labor markets is a growing phenomenon that has received very little attention.

For the most part, the theoretical literature on offshoring has outpaced the empirical research, leaving room for an exceptionally rich and fruitful research agenda. However, practically all of the recent theoretical literature on offshoring applies to developed countries offshoring to underdeveloped countries. Moreover, the bulk of the theoretical literature is primarily concerned with the impact of offshoring on domestic labor markets. As Sachs points out, new theoretical models will be needed to fully understand the impact of offshoring by China and India. Taking these points into consideration, we highlight below what we believe to be the most promising areas for future research.

Does Offshoring Increase Income Volatility? Limited evidence for Mexico and the United States suggests that offshoring industries in Mexico experience job volatility twice that of corresponding industries in the United States. Earlier work on offshoring by U.S. multinationals found that workers in countries with similar levels of wages compete with one another for the same jobs. One implication of these earlier findings is that workers in low-wage countries that previously attracted a lot of offshoring may be particularly vulnerable to losing jobs to China. More recent work suggests that this is likely to be the case for workers with similar skill sets across developed and developing countries. Finally, workers who lose jobs in developed countries as a result of offshoring tend to move to lower paying jobs with less job security. All of this suggests that offshoring could indeed increase income volatility, particularly at the low end of the income distribution. Further research documenting the extent and magnitude of these effects is warranted.

Does Offshoring Increase Wage Inequality? Early evidence has suggested that offshoring could explain as much as 25 percent of the increase in wage inequality in the United States between 1977 and 1990.

The boom in offshoring following this study has been significant, suggesting that a reevaluation of the data is in order. Evidence for developing countries is much more limited. The fact that foreign firms in developing countries tend to pay higher wages and hire relatively skilled labor suggests that offshoring may play an important role in determining wage inequality in developing countries. Country studies that combine sectoral data on offshoring with individual wage and occupation data could help shed light on this issue.

Much Ado About Nothing? Even if offshoring has had an effect on employment and wages, the magnitude of these effects is not well understood. Most studies for developed countries have found that offshoring comes at the expense of domestic jobs, but the magnitude of these effects is limited. Similarly, most studies have found little or no effect of offshoring on wage levels in developed countries. There is surprisingly little evidence on the employment effects of offshoring for developing countries. Most of the evidence is for wages and finds that foreign firms pay a wage premium, but the magnitude of this premium is smaller than previously thought. There are a number of reasons to believe that these effects could be much larger for developing countries (see for example Bergin et al 2009). More evidence documenting the employment and wage effects of offshoring for developing countries would help us to understand whether, in fact, we are making much ado about nothing.

What are the General Equilibrium Effects of Offshoring? Studies that look for the impact of offshoring by looking at *within industry* trends in wages and employment miss two potentially important effects of offshoring. First, they do not adequately capture the wage losses or gains accruing to individuals who shift from manufacturing to other sectors of the economy. The associated distributional implications are likely to be important given the magnitude of the reallocation and a historically important wage premium paid to manufacturing workers in the United States and elsewhere. In

addition to distributional consequences, there may also be efficiency consequences associated with the reallocation of labor from high to low wages industries – see for example Katz and Summers (1989). Finally, these studies do not capture the cumulative impact of import competition on workers who are easily able to relocate across sectors but cannot easily shift across occupational categories. The most recent work on offshoring indicates that these effects are important in the US labor market. Not only are these issues likely to be important for other countries, but their importance calls into question results of previous studies that looked only for the labor market effects of trade and offshoring within industries. The challenge here is to identify datasets that are rich enough to enable researchers to capture the general equilibrium effects of offshoring. This is likely to involve gathering data from a variety of sources. The payoffs to this type of research are likely to be large given the paucity of empirical work.

What are the Implications of Offshoring by China? Between 1990 and 2005 outward direct investment from China grew from US$ 0.8 billion to more than US$ 12 billion (Buckley et al, 2008). Yet, if one does a literature search for offshoring and China, the only thing that comes up are articles and reports touting the benefits of China as a destination for offshore activity. Anecdotal evidence suggests that offshoring by China is different from offshoring by the US. For example, much offshoring by China is done by state-owned enterprises often importing labor from China. The implications and labor market consequences of offshoring by China warrant further attention from both theoreticians and empiricists.

References

Antras, Pol, Luis Garicano, and Esteban Rossi-Hansberg, "Organizing Offshoring: Middle Managers and Communication Costs," NBER Working Paper 12196, May 2006.

Ash, Lucy, "China in Africa: Developing Ties," BBC News, 4 December 2007. Available at http://news.bbc.co.uk/2/hi/africa/7047127.stm.

Autor, David H., Frank Levy and Richard J. Murnane, "The Skill Content of recent Technological Change: An Empirical Exploration," Quarterly Journal of Economics, 2003.

Bergin, Paul, Robert C. Feenstra, and Gordon H. Hanson, "Outsourcing and Volatility," NBER Working Paper 13144, 2009.

Berman, Eli, John Bound, and Stephen Machin, "Implications of Skill-Biased Technological Change: International Evidence," Quarterly Journal of Economics, 1998 : 113,1245-1280.

Brainard, Lael and David Riker, "US Multinationals and Competition from Low Wage Countries," NBER Working Paper 5959, March 1997.

Brainard, Lael and David Riker, "Are US Multinationals Exporting US Jobs?," in Globalization and Labour Markets, ed. By D. Greenaway, and D.R. Nelson, Vol. 2, Elgar, Cheltenham, UK and Northhampton, MA, 2001: pp. 410-26

Desai, Mehir, Fritz Foley and James Hines, "Foreign Direct Investment and Domestic Economic Activity," Harvard Business School Working Paper, November 2005

Desai, Mehir, Fritz Foley and James Hines, "Domestic Effects of the Foreign Activities of U.S. Multinationals," American Economic Journal, vol. 1, No. 1, February 2009: 181-203.

Ebenstein, Avi, Ann E. Harrison, Margaret McMillan, and Phillips, "Estimating the Impact of Trade and Offshoring on American Workers Using the Current Population Surveys," June 2009.

Feenstra, Robert C., "The Impact of International Trade on Wages," NBER Books, National Bureau of Economic Research, Inc, number feen00-1, June 2000.

Feenstra, Robert C., "Offshoring in the Global Economy," Ohlin Lectures, presented at the Stockholm School of Economics, September 2008. Available at http://www.econ.ucdavis.edu/faculty/fzfeens/pdf/Feenstra_Ohlin_Lecture_2008.pdf.

Feenstra, Robert C. and Gordon H. Hanson, "The Impact of Outsourcing and High-Technology Capital on Wages: Estimates for the U.S., 1979-1990," Quarterly Journal of Economics, 114(3), August 1999: 907-940.

Feenstra, Robert C. and Gordon H. Hanson, "Foreign Direct Investment and Relative Wages: Evidence from Mexico's Maquiladoras," Journal of International Economics, 42(3/4),

May 1997: 371-393.

Grossman, Gene and Esteban Rossi-Hansberg, "Trading Tasks: A Simple Theory of Offshoring," Working Paper, 2006.

Hanson, Gordon, Ray Mataloni and Matthew Slaughter, "Expansion Abroad and the Domestic Operations of US Multinational Firms," mimeo, 2003.

Harrison, Ann E., and Margaret McMillan, "Outsoucring Jobs? Multinationals and U.S. Employment," NBER Working Paper, March 2007.

Harrison, Ann E., Margaret McMillan, and Null, Clair, "U.S. Multinational Activity Abroad and U.S. Jobs: Substitutes or Complements?" Journal of Industrial Relations, Vol. 46, No. 2, pp. 347-365, April 2007.

Harrison, Ann E. and Andres Rodriguez-Clare, "Trade, Foreign Investment, and Industrial Policy for Developing Countries," forthcoming, Handbook of Development Economics, February 2009. Available at http://are.berkeley.edu/~harrison/HandbookFeb200911.pdf

Harrison, Ann E. and Jason Scorse, "Improving the Conditions of Workers? Minimum Wage Legislation and Anti-Sweatshop Activism," California Management Review, vol. 48, No.2, 2008. Available at http://are.berkeley.edu/~harrison/ImprovingConditionsWorkers.pdf

Helpman, Elhanan, "A Simple Theory of International Trade with Multinational Corporations," The Journal of Political Economy, 1984.

Hoekman, Bernard and Alan L. Winters, "Trade and Employment: Stylized Facts and Research Findings," Working Papers 7, United Nations, Department of Economics and Social Affairs, 2005. Available at http://www.un.org/esa/desa/papers/2005/wp7_2005.pdf

Karabay, Bilgehan and John McLaren, "Trade, Offshoring, and the Invisible Handshake," NBER Working Paper 15048, June 2009.

Katz, Lawrence F. and Lawrence H. Summers, "Can Inter-Industry Wage Differentials Justify Strategic Trade Policy?" NBER Working Paper 2739, November 1989.

Krugman, Paul R., "Trade and Wages, Reconsidered," Brookings Panel on Economic Activity, 2008. Available at http://www.princeton.edu/~pkrugman/pk-bpea-draft.pdf.

Liu, Runjuan and Daniel Trefler, "Much Ado About Nothing: American Jobs and the Rise of Service Offshoring to China and India," NBER working paper 14061, 2008.

Lovely, Mary E. and J. David Richardson, "Trade Flows and Wage Premiums: Does Who or What Matter?," NBER Chapters in The Impact of International Trade on Wages, National Bureau of Economic Research, 2000: 309-348.

Mankiw, Gregory, and Phillip Swagel, "The Politics and Economics of Offshore Outsourcing," NBER Working Paper 12398, July 2006.

Markusen, James R., "Trade in Producer Services and in Other Specialized Intermediate Inputs,"

American Economic Review, vol. 79, No.1, March 1989: 85-95.

Markusen, James R. and Keith Maskus, "General-Equilibrium Approaches to the Multinational Firm: A Review of Theory and Evidence," NBER Working Paper 8334, 2001.

Martins, Pedro and Luiz Alberto Esteves, "Is There Rent Sharing in Developing Countries? Matched-Panel Evidence from Brazil," Working Papers 0017, Universidade Federal do Paraná, Department of Economics, 2007. Available at http://www.economiaetecnologia.ufpr.br/textos_discussao/texto_para_discussao_ano_2007_texto_08.pdf

Mitra, Devashish and Priya Ranjan, "Offshoring and Unemployment," NBER Working Paper 13149, June 2007.

Muendler, Marc-Andreas and Sascha O. Becker, "Margins of Multinational Labor Substitution," UCSD Working Paper, April 15, 2006.

Rodrik, Dani, "Trade, Social Insurance, and the Limits to Globalization," NBER Working Paper 5905, January 1997.

Sachs, Jeffrey D. "The Rise of TNCs from Emerging Markets: the global context" in The Rise of Transnational Corporations from Emerging Markets: Threat or Opportunity? ed. Karl Sauvant, 2009.

Spencer, Barbara J. (2005). "Presidential Address: International Outsourcing and Incomplete Contracts." Canadian Journal of Economics, 38:4, November 2005: 1107-1135.