

THE EFFECTS OF OFFSHORING ON DOMESTIC WORKERS:

A REVIEW OF THE LITERATURE

Andre Barbe

David Riker

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ABSTRACT

This review of the economics literature on offshoring describes the trade in tasks framework that modern sources use to understand offshoring, and then discusses the four main issues focused on in prior work: (1) the relative price, productivity, and net effect of offshoring; (2) the different effects of offshoring for high and low skill workers; (3) the different types of offshoring; and (4) the relative importance of offshoring and technological change.

Andre Barbe

Office of Economic, Research Division

Andre.Barbe@usitc.gov

David Riker

Office of Economics, Research Division

David.Riker@usitc.gov

1 Introduction

Offshoring occurs when part of a supply chain is moved from one country to another. For example, in the 1980s U.S. semiconductor manufacturers typically produced, assembled, tested, and packaged their semiconductors entirely in the United States (Brown, Linden, and Macher 2006). Today, U.S. semiconductor manufacturers still produce the semiconductor wafers in the United States, but the assembly, testing, and packaging steps are usually done abroad. Similar trends are also seen in other manufacturing industries such as automobiles, furniture, textiles, and apparel. In 1982 U.S. multinationals had 30 of their labor force in foreign affiliates from 30% (Harrison and McMillan 2011). By 2014, it had increased to 60% (Bureau of Economic Analysis 2017).¹

The decades of increased offshoring also saw substantial changes in employment in the U.S. manufacturing sector. The number of Americans employed in manufacturing fall from almost 20 million in 1980 to a little over 12 million in 2017 (see Figure 1). At the same time, inequality increased in the manufacturing sector. The ratio of nonproduction to production workers employed in U.S. manufacturing increased from 35:100 in 1980 to almost 45:100 in 2011 (Feenstra 2017). And the wages of nonproduction workers increased from 50% higher than production workers in 1980 to 85% higher in 2011 (Feenstra 2017). There is a belief that production jobs in manufacturing once allowed even low skill workers to acquire high paying jobs, but that these opportunities are now disappearing.

Offshoring has been put forth as an explanation for this trend. The story typically goes something like this: the costs of offshoring have been falling for decades. This has reduced the relative price to U.S. firms of foreign labor as compared to U.S. labor. This relative price effect then caused firms to increase their demand for foreign labor and reduce their demand for domestic labor. As a result, employment and wages of domestic labor fell.

A large literature has developed to investigate this claim and examine alternative explanations. The literature has found four main issues that drive the analysis of offshoring: (1) trade in tasks, (2) the relative price, production, and net effects of offshoring, (3) heterogeneity, and (4) technological change.

First, not only can goods be traded across countries, but the tasks that make up a good can also be located across multiple countries. Thinking of offshoring in this manner reveals effects that would be ignored in a framework with only trade in goods.

Second, offshoring occurs through several different effects. And although the relative price effect decreases domestic employment, the productivity effect increases it. As a result, the literature has generally found the net effect of offshoring on domestic employment to either be zero, or only mildly negative.

Third, there is a large amount of heterogeneity in both the things that are labeled “offshoring” and the different effects it can have for different groups. As a result, offshoring can have different effects on employment or wages, depending on which type of offshoring or whose employment and

¹ When production is moved abroad, it may either be done by a foreign affiliate that is part of the same multinational enterprise, or done by an unaffiliated firm. The business literature typically only refers to the former process as offshoring. The industrial organization and international trade literatures refer to the sum of the two as offshoring, and that is the definition we will use in this paper (Crinò 2009).

wages you are referring to. Typically, offshoring is better for higher skill workers than lower skill workers, and service offshoring is better for domestic workers than material offshoring.

Fourth, technical change in the form of increased automation has also occurred during this time period, and thus is an alternative explanation for the fall in domestic manufacturing employment. The literature has consistently found that technological change was responsible for more change in employment than offshoring. However, “less important than technology” covers a wide range of impacts, and there is less agreement on the share attributable to offshoring.

The remainder of this paper gives an overview of the literature on each of these topics. Section 2 discusses the trade in tasks framework. Section 3 discusses the relative price, productivity, and net effects of offshoring. Section 4 discusses the different effects of offshoring for high and low skilled workers. Section 5 discusses different types of offshoring. Section 6 discusses the relative importance of offshoring and technology in explaining employment trends. Section 7 concludes.

2 Offshoring as Trade in Tasks

Historically, trade could be characterized by the exchange of goods between different countries. And so models of trade used frameworks in which goods are created in different countries from factors of production (like labor and capital) in those countries. But in their seminal paper, Grossman and Rossi-Hansberg (2008) argue that modern trade is better characterized by small amounts of value being added in many different locations. This occurs through extensive trade in intermediate forms of the good, as well as the international location of intangible production tasks, such as design, management, or IT support (Oldenski 2012).

Grossman and Rossi-Hansberg (2008) propose modeling modern trade using a new framework that they call “trade in tasks.” In it, factors of production are first combined to complete tasks, and then tasks are combined to create goods. The innovation of the new framework is that a single good can be produced from tasks completed in multiple countries, using the lower prices for factors of production in those countries. However, there are costs to offshoring and some tasks are more costly to offshore than others. These tradeoffs over the location of different tasks determine firms’ offshoring decisions.

The trade in tasks framework makes a number of assumptions and predictions that have been verified in subsequent work. For example, their model predicted the existence of the productivity effect subsequently measured by Amiti and Wei (2009), Ottaviano, Peri, and Wright (2013), and Wright (2014). The model assumes that task characteristics (like the importance of communicating with customers) are predictive of the amount of offshoring done by firms in that industry, and this prediction was verified by Oldenski (2012) and Wright (2014). Grossman and Rossi-Hansberg (2008) also predicts that occupations that do tasks that are more easily tradeable are more likely to be offshored and thus will experience larger wage drops. The employment effect was empirically found by Crinò (2010) and the wage effect was found by Hummels et al. (2014). As a result of its empirical and theoretical support, trade in tasks is the main framework used for understanding offshoring today.

3 The Relative Price, Productivity, and Net Effects of Offshoring

3.1 Understanding the Effects of Offshoring

A reduction in the cost of offshoring affects a firm's production decisions through two main channels: a relative price effect and a productivity effect.² These are analogous to the substitution and income effect in a consumer optimization problem. Like in the substitution effect, when the price of an input (like foreign labor) falls, other inputs are relatively more expensive, leading firms to substitute towards the foreign labor whose price fell and possibly away from the domestic labor whose price did not change (more on that "possibly" in the relative price section). However, in addition to the relative price effect, a drop in the price of foreign labor decreases the total cost of producing a unit of the good. This productivity effect increases the quantity of the good demanded and the quantity of all inputs used, including domestic labor. The net effect of a reduction in offshoring costs on domestic labor demand is the sum of the relative price and productivity effects.³

3.2 Relative Price Effect

We've discussed how offshoring lowers the cost of foreign relative to domestic production and described a story where this leads to substitution away from domestic workers. But such substitution is not inevitable: whether it occurs or not depends on whether foreign and domestic workers are complements or substitutes in the firm's production process. For example, imagine the firm's production process had domestic workers design their products, which were then assembled abroad. In such a case, the two types of labor are complements because both stages of production will expand or contract together when the price of one of the types of labor changes. It is thus an empirical question as to whether this relative price effect has either a positive or negative effect on domestic employment. A review by Crinò (2009) states that while a large number of studies find that domestic and foreign labor are substitutes, the relationship is weak. More recent research such as Ottaviano, Peri, and Wright (2013) has also found that the two are substitutes.

3.3 Productivity Effect

Research has generally found the productivity effect to be large. Amiti and Wei (2009) found that offshoring accounts for around 15 percent of the labor productivity growth from 1992 to 2000. Ottaviano, Peri, and Wright (2013) finds that an increase in the share of offshore employment by 1 percent is associated with an increase in aggregate employment (of offshore plus domestic) of 1.7 percent. Wright (2014) finds a smaller productivity effect where the productivity effect of a one percentage point increase in the extent of offshoring offsets 69 percent of the negative relative price effect.

² The relative price effect is sometimes referred to as the displacement effect, such as in Ottaviano, Peri, and Wright (2013).

³ Technically, these are only the partial equilibrium effects of offshoring. In a general equilibrium setting, offshoring would also impact employment through its differential impact on industries with different factor intensities, and its reduction in the price of final consumer goods. The literature has less to say on these general equilibrium effects, as they are typically assumed to be of second order importance, but it may represent a fruitful area for future research.

3.4 Net Effect

The net effect of a reduction in offshoring costs on domestic employment is the sum of the relative price and productivity effects. Although the consensus on the relative price effect means that offshore and domestic labor are gross substitutes, they may be net substitutes, or net complements, depending on the size of the negative relative price effect compared to the size of the positive productivity effect.

There are mixed results on the effect of offshoring when all types of labor are combined. Ottaviano, Peri, and Wright (2013) find that offshoring increases total domestic employment (summed over all worker types) relative to a scenario where all tasks were performed domestically. In the industries most exposed to offshoring, they find that native employment has not been harmed, but promoted, due to an expansion of these domestic industries relative to others. Wright (2014) finds that the productivity effect only offsets 69 percent of the relative price effect, so that on net, offshoring does reduce low-skill native employment. However, this net effect only accounts for approximately 6 percent of the average annual decline in production (low-skill) workers, 69,000 out of the 1.2 million jobs lost. However, note that while these are the impacts on U.S. workers on average, research has generally found the effects to be different for different groups of workers and for different types of offshoring.

4 Different Effects of Offshoring for High and Low Skill Labor

4.1 Why Offshoring has Different Effects on High and Low Skill Labor

One of the key areas of public concern about offshoring is how it may adversely impact low skill workers. In particular, firms may have greater incentives to offshore the tasks of low skill workers than high skill. This is driven by the different tasks that high and low skill workers do, and the different costs of offshoring these tasks.

From a firm's perspective, offshoring a task reduces some costs but increases others. Offshoring to a low income country will typically reduce labor costs, due to lower wages in the foreign country. However, it will also increase costs, due to the expense of monitoring and coordinating workers. A profit-maximizing firm will offshore a task if the net effect is to reduce costs. However, different tasks require more or less monitoring and coordination. As a result, offshoring is most likely to be cost effective for tasks where domestic wages are high relative to foreign wages, and the task requires little monitoring or coordination.

Different tasks have different wage ratios and require different amounts of monitoring. In particular, firms are more likely to offshore stages of production that involve more routine tasks and less communication (Oldenski 2012). Since low skill jobs are correlated with more routine tasks, this means that low skill jobs are more likely to have their tasks offshored. This leads to larger relative price impacts, as well as larger productivity effects (Grossman and Rossi-Hansberg 2008).

However, while this story explains why the impact of offshoring could be different on low skill workers than on high skill, it doesn't measure these differences. In order to answer that question, we must review the empirical literature and what it found.

4.2 Empirical Evidence on the Effects for High and Low Skill Labor

The literature has generally found offshoring to have different effects for high and low skill labor. Many papers find that offshoring benefits high skill workers relative to low skill workers. Research has also typically found that the absolute effects on low skill are negative. However, there is less agreement on the effects of offshoring on high skill workers. The trade in tasks framework is a plausible explanation for this lack of consensus.

Papers have generally found that high skill workers benefit from offshoring relative to low skill workers. Feenstra and Hanson (2001) show that offshoring is associated with increases in the share of wages paid to skilled workers. Feenstra and Hanson (1999) found that offshoring was responsible for 15 percent of the increase in relative wages of nonproduction workers. Crinò (2012), Crinò (2010), and Crinò (2009) found that it increased the relative demand for skilled workers. In particular, Crinò (2009) reviews the available literature and concludes that offshoring has been an important determinant of rising wage inequality during the 1980s. Grossman and Rossi-Hansberg (2008) argue that the relative-price effect should reward high-skilled labor but harm low-skilled labor, for the usual (Stolper-Samuelson) reasons: when a good's price falls, the return of the factor used intensively in its production also falls. And Harrison and McMillan (2011) find that offshoring has positive employment effects for firms whose workers do different tasks at home and abroad, and negative employment effects when they do similar tasks. One slight exception is Antràs, Garicano, and Rossi-Hansberg (2006), who develops a theoretical model where it is possible for offshoring to lower wage inequality, if skilled management is common and communication costs and skill overlap are large.

Papers have typically found the absolute impact of offshoring on low skill workers to be negative. Hummels et al. (2014) finds that if a firm doubles its offshoring, its unskilled workers can expect a present discounted value of wage losses equal to 11.5 percent over five years. Wright (2014) finds that offshoring to China is responsible for 6 percent of the average annual decline in low-skill worker employment from 2001-2007, or 69,000 out of 1.2 million jobs lost. Crinò (2012) finds that certain types of offshoring harm low skill workers.⁴

The net effect of offshoring on high skill workers is more contentious. Hummels et al. (2014) finds that if a firm doubles its offshoring, its skilled workers can expect a present value of wage losses equal to 1.4 percent over five years. Although this is sensitive to the definition of high skill, and for some definitions, there are net benefits. Wright (2014) found that offshoring to China had a negative impact on low-skill workers but that it increased the employment of high-skill workers by 1 percent. Combining the estimates for both low- and high-skill worker types, offshoring to China resulted in an overall increase in domestic employment of 2.6 percent over the period following China's accession to the WTO.

4.3 Evidence for the Trade in Tasks Explanation

Differences in tasks for different jobs can explain the differential effects for high and low skill workers. Hummels et al. (2014) finds that the impact of offshoring on workers depends on the tasks in their occupation. Oldenski (2012) looks specifically at services offshoring and finds that routine jobs are

⁴ Specifically, Crinò (2012) finds that material offshoring harms low skill but service offshoring does not. This distinction between service and material offshoring is explained in Section 5.

offshored, but non-routine are not, leading to high skill, high pay jobs being performed in the United States, while low skill, low paying jobs are moved abroad. Ottaviano, Peri, and Wright (2013) finds that offshoring leads to increased polarization in native and immigrant specialization, mainly by pushing natives toward more complex jobs, effectively hollowing out the task spectrum.

Tasks could also explain the disagreement over the impact of offshoring on high skill workers: Hummels et al. (2014) finds that occupations with routine tasks experience larger wage drops, occupations with math, language, or social science tasks gain, and workers with natural science or engineering tasks were unaffected.

5 Different Types of Offshoring

A number of different phenomena are lumped together under the label of “offshoring.” This is likely because the true framework, trade in tasks, is difficult to observe. As a result, other dimensions of heterogeneity may be studied instead as proxies for unobservable task trade. The literature has focused on two such dimensions: the income level of the country being offshored to, and whether the job being offshored is material or service related.

These observable characteristics are likely correlated with certain tasks. For example, different types of tasks are going to be offshored to high income countries than low income countries. Similarly, when services are offshored, different tasks are going to be offshored than in material offshoring.

5.1 Income Level of Offshore Country

Several papers have found that offshoring to high income countries has negative effects on U.S. employment. Crinò (2009) argues that the main substitute for domestic labor is foreign labor in high income countries, not foreign labor in low income countries. Similarly, Harrison and McMillan (2011) find that if home and foreign tasks are similar, foreign and domestic employees are substitutes: a 1 percentage point fall in affiliate wages is associated with reductions in parent employment of between 0.0 and 0.6 percent. However, if tasks are different, then they are complements: a 1 percentage point decline in low-income affiliate wages is associated with increases in parent employment of between 0.1 and 0.8 percent.

5.2 Material and Service Offshoring

Firms may offshore many different parts of their production process. If they offshore the production of a physical good that is then imported, that is called material offshoring. However, if they offshore some service (such as IT support, product design, or research and development) then that is called service offshoring. Material offshoring was the predominant type of offshoring before 1990, while service offshoring became much more prominent afterward (Feenstra 2017).

These two types off offshoring are distinct, as workers engaged in either of these activities are responsible for very different tasks. As a result, we might suspect that these two types of offshoring could have different effects on workers. Moreover, since workers engaged in services are typically more high skilled than those in production, these different types of offshoring could easily impact high and low skilled workers differently.

Researchers looking at this issue have generally found more positive effects for service offshoring than material offshoring. Crinò (2009) conducts a thorough review of the literature up through 2008. Researchers found that material offshoring worsens wage inequality between skilled and unskilled workers. However, while service offshoring shifts workforce composition towards skill labor, it has at most a small negative impact on total employment. More recent research has produced mostly similar results. Crinò (2012) finds that both material and service offshoring raise demand for high and medium skilled workers relative to low skill, although the effects are small. Sitchinava (2008) finds that materials offshoring increased the relative wages for skilled workers while service offshoring acted in the opposite direction, increasing the relative wage of unskilled workers. Amiti and Wei (2009) found that services offshoring was responsible for 10 percent of labor's productivity growth, and 5 percent for material offshoring.

6 Technological Change as an Alternative Explanation for the Decline of Domestic Manufacturing

6.1 Changing Views on Technology versus Offshoring

Economists initially identified technological progress as the main culprit for the increase in the relative demand for skilled labor. New technologies tend to complement skilled workers but substitute for unskilled workers, resulting in skill-biased technical change (Crinò 2009). As a result, the rapid technological progress in computers since the 1980s could explain why the demand for skilled labor increased during that time period. Crinò (2009) reviews a number of empirical studies from 1994 to 2003 that confirm this prediction.

This initial work identified a number of facts that seemed to rule out offshoring as an explanation. As noted by Feenstra (2017), a simple Heckscher-Ohlin model would require offshoring to generate different relative wage effects in the home and foreign country. But that was not what was observed. Studies such as Berman, Bound, and Machin (1998) confirmed that the same shift towards skilled workers in the U.S. also occurred abroad.

However, the international trade literature has proposed new mechanisms that would allow for offshoring to produce labor demand effects that are consistent with these observations. (1) Offshoring could itself cause skill biased technical change, (2) it could cause skill-biased scale effects that act similarly to technical change, or (3) it could be specifically the material offshoring that is the cause of the labor market changes (Crinò 2009). By these mechanisms, offshoring may produce labor effects similar to those of technological change. This has resulted in a reevaluation of the relative impact of offshoring and technological change.

6.2 Empirical Evidence on Offshoring vs Technology

Recent research has shown that offshoring is responsible for some of the change in relative demand, but most is due to technological change. The literature before 2008 generally found that material offshoring increased the employment and wage share of skilled workers, but studies rarely held it responsible for most of the observed changes (Crinò 2009). More recently, Harrison and McMillan (2011) find that that offshoring is not the primary driver of declining domestic employment of U.S. manufacturing multinationals between 1977 and 1999: it is primarily due to technological change.

However, Sitchinava (2008) found that while offshoring was an important driver of growing wage inequality, the role of technology was inconclusive.

7 Conclusion

Offshoring is a contentious political issue. Unfortunately, it is also a complex economic issue, with many subtle aspects in which a simple model may over-simplify and thus miss key mechanisms or outcomes. But by using the trade in tasks framework, we are able to think about the problem in a way that keeps the necessary details but omits the unnecessary ones. Continued application of this framework in future work will increase our understanding of the key issues in offshoring: (1) the relative price, productivity, and net effect of offshoring, (2) the different effects of offshoring for high and low skill workers, (3) the different types of offshoring, and (4) the relative importance of offshoring and technological change.

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