On modeling task, skill and technology upgrading effects of globalization with heterogeneous labor ☆

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ABSTRACT

We adapt Yeaple's (2005) heterogeneous agent framework to model firms in the North as making explicit off-shore outsourcing decisions to cheap-labor economies. We highlight how firms' technology transformations due to globalization will induce skill upgrading in the North, increase aggregate productivity, average wages and therefore total welfare at the cost of increased wage inequalities. We analytically derive conditions under which all consumers – including lower-skilled workers – might nevertheless gain from the surge of offshore outsourcing. We also show that extending the model to the more realistic case of multi-product firms tends to boost the potential welfare gains.

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1. Introduction

Recent revolutionary advances in transportation and communication technologies coupled with institutional progress in many cheap labor countries have provided firms in the North with strong new incentives to extensively adopt offshore outsourcing strategies and transfer larger parts of their production activities to the South. Though the transferred activities are bound to be dominantly low-tech manufacturing shifting the demand for production workers at home, some white collar jobs that were previously protected from foreign competition are now threatened by these new factor-cost saving opportunities. The prospect of massive offshoring in white collar services, and its potential negative welfare implications, has surged as a major political issue in the North today. Though the extent of outsourcing to low-wage countries is currently less than one might infer from media reports, it is hard to exclude the possibility that firms in the North could transfer much larger parts of their labor-intensive activities to the South. Assuming this does happen, and that Western multinationals start massively shipping products back to the home market, will that inevitably disrupt local labor markets?

Addressing this issue, Mankiw and Swagel (2006) note that, though there exists a large theoretical literature on the positive aspects of offshore outsourcing focusing on the factors influencing firms' choices of organizational structure and location of production, relatively little normative analysis is available on the welfare impact of offshoring. Most existing papers tend to suggest that offshore outsourcing is a modern form of trade, and that it will therefore almost inevitably imply that there are winners and losers – the curse of Stolper–Samuelson – the gains from the first being large enough however for

the latter to be compensated.[1] Key to this Stolper–Samuelson prediction is the assumption that technologies are exogenously given. Our paper contributes to qualify this perception: we show that offshoring need not inevitably lead to lower welfare for domestic labor. The argument is that, by making profitable expensive-to-set-up but cheaper-to-operate technologies, globalization will induce domestic firms, as they turn multinational, to adopt more efficient technologies that previously existed but were too costly. Consequently, a potentially large subset of workers in the North is likely to be relocated to more productive activities, earning better wages. There is ample evidence that this mechanism is of some empirical relevance. Indeed, it is well established that multinationals use better technologies and are therefore more efficient than their purely domestic competitors. Furthermore, Head and Ries (2002) have investigated the influence of offshore production by Japanese multinationals on domestic skill intensity, using firm-level data. They find that additional foreign affiliate employment in low income countries raises skill intensity at home: vertical specialization by multinationals does indeed seem to contribute to skill upgrading domestically.[2]

To model this mechanism, we adapt Yeaple (2005) to a North–South setting. Workers are heterogeneous by their (exogenously given) skill levels and therefore differ in their abilities to operate different technologies; firms are ex ante identical but become different by endogenously choosing among the available production technologies. Two types of tasks – "repetitive" versus "conceptual" – enter in the production process of two intermediate inputs, respectively "manufacturing" and "headquarter services", which enter complementarily in the production of final differentiated goods. The two tasks may be performed in different geographical locations: though conceptual tasks are exclusively performed in the North, repetitive tasks can also be performed in the South at lower cost than in the North. To produce headquarter services, two different technologies are available, a high fixed-cost low marginal-cost technology (the high tech) and a low fixed-cost high marginal-cost technology (the low tech). In equilibrium, workers will sort between production activities according to their abilities, with the ablest workers producing headquarter services and the less able producing manufacturing intermediates. Among non-production workers employed in headquarter services, the ablest will be employed by the high-tech firms. Since offshoring involves a fixed cost, a firm must have sufficiently large sales volumes for this activity to increase profits. Hence, only those firms that choose the high fixed-cost low marginal-cost technology will find it profitable to invest abroad, substituting cheap foreign labor for domestic labor in the production of manufacturing. Globalization is implemented as an exogenous reduction of the fixed cost of offshoring.[3] We demonstrate that this inevitably induces some initially low-tech domestic-only firms to technology upgrade as they turn into multinationals. Consequently, some workers task upgrade as they are relocated to operate more efficient technologies, enhancing the economy's global productivity. Furthermore, the consecutive market size effect increases the set of product varieties available to consumers, in particular to the less-skilled.[4] We demonstrate that, under fairly mild conditions, real

wages will rise even at the lower end of the skill ladder. These potential welfare gains are shown to increase when firms' product scope is made endogenous. To get a feeling of the quantitative effects involved, we run a few numerical simulations using a parameterized version of the model roughly calibrated on U.S. data.

We are not the first to reach such normative conclusions, though we use a very different modeling approach. An early paper by Feenstra and Hanson (1996) develops a Heckscher–Ohlin type model without factor-price equalization. They show that outsourcing leads to a productivity increase for firms which will lower the prices for final goods; this reduction in consumer prices, they stress, could exceed the fall in wages of the less-skilled workers. More recently, Grossman and Rossi-Hansberg (2007, 2008) also demonstrate that, depending on demand parameters, productivity growth induced by increased offshoring opportunities can benefit the factor intensely used in the sector with decreasing offshoring costs. An innovative aspect of their analysis is to focus, in a perfectly competitive environment, on the nature of tasks performed on the job; this, they advocate, is more relevant for a job's propensity to be offshored than either the skill-intensity of the occupation or the education level of the worker. The conceptual shift may prove extremely important (in particular for empirical investigations, see e.g., Becker et al. (2009)) but complexifies the theoretical analysis.[5] In contrast with the previous authors, we acknowledge the important role of economies of scale and within-firm scope decisions, and make imperfect competition an indispensable ingredient in the shaping of the new global economy.[6] In particular, we explicitly consider the effect of globalization on four firm-level decisions – entry, technology choice, whether or not to offshore outsource and the type of workers to employ – so that we can account for the observed fact that, to take advantage of the new low-cost opportunities, firms tend to upgrade technologically.[7] By modeling scope choices, we additionally highlight a globalization-induced rationalization effect – firms become more efficient by focusing on their core competence – and show that this tends to amplify the technology/skill upgrading mechanism, thereby leading to higher welfare gains. Our model remains nevertheless quite simple and the results intuitive. As we shall argue in the paper, the highlighted characteristics of firms that engage in offshore outsourcing are consistent with empirical evidence.

The paper is organized as follows: the model is laid down in Section 2 with single-product firms; the effects of globalization are analyzed in Section 3 with some numerical results reported in Section 4. We then extend the model to the case of multi-product firms in Section 5, and show that our previous conclusions are confirmed, and that the effects are amplified. The paper closes with a conclusion, followed by technical appendices.

2. The model

2.1. Households

Households are endowed with Dixit–Stiglitz preferences defined on a continuum of differentiated products. We write:

$$X = \left[\int_{i \in N} x^d(i)^\rho \, di \right]^{\frac{1}{\rho}}, \ \ 0 < \rho < 1 \tag{1}$$

where N represents the mass of available varieties; $x^d(i)$ denotes consumption demand for each variety i and $\sigma = 1/(1 - \rho)$ is a constant

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[1] See Deardorff (2005, 2006) for an illuminating discussion on this.

[2] Hansson (2005) reaches similar conclusions on Swedish MNEs during the years 1990–97. The period is particularly interesting because it covers the years after the iron curtain was lifted: Swedish MNEs have extensively taken advantage of the large supply of cheap labor in the immediate neighborhood which the processes of transition in the CEECs has given rise to. He finds a non-trivial, significantly positive, impact on skill upgrading in Swedish MNE parents of the increased employment share in their affiliates in non-OECD countries.

[3] A drop in transportation costs will increase the cost advantage of multinationals, and hence yield identical qualitative results, as will become clear. Also, in some sectors of activity, Marshallian-type scale economies (externalities) can lead to dynamic productivity gains that will contribute to increase the competitive advantage of the South, and induce more firms to adopt offshore-outsourcing production strategies. Mitra and Ranjan (2008) strongly make this point, and develop an interesting dynamic model that rationalizes this latter mechanism, which we do not have in our model.

[4] See Broda and Weinstein (2006) for an empirical investigation of the gains from trade for the U.S. due to the worldwide expansion of available varieties of goods.

[5] Their result also hinges on an assumption on technical progress that raises questions: see Taylor (2006).

[6] Even though we focus on offshore outsourcing, our model could be seen as closely related to the traditional vertical FDI literature. See Helpman (1984) and Markusen (2002, Ch.9) for modeling of vertical MNEs under increasing returns to scale and imperfect competition.

[7] See e.g., Navaretti et al. (2006) for a discussion on technological upgrading related to firms switching from national to multinational.