

Offshoring and Firm Overlap

Stella Capuano¹, Hartmut Egger², Michael Koch³ and Hans-Jörg Schmerer⁴

Offshoring and its effects on domestic labour markets have played a prominent role in academic research and the public debate over the last two decades. In recent years, attention in the literature has shifted towards understanding the specific nature of firms that choose to offshore. Existing theoretical contributions have shown that offshoring firms are larger, more productive, and make higher profits than their non-offshoring competitors make. However, they have so far missed to explain the empirical fact that offshoring and non-offshoring firms coexist over a wide range of the revenue distribution.

Explaining this fact and shedding light on how it changes the conclusions we draw when it comes to the consequences of offshoring are the aims of this paper. We construct a theoretical model that captures two features, which are characteristic for the empirical pattern of offshoring: *Selection*, because offshoring is more common among producers from higher quantiles of the revenues distribution, *Overlap*, since there is coexistence of offshoring and non-offshoring producers in the various quantiles of the revenue distribution. After a thorough theoretical analysis, we structurally estimate key parameters of our model, using firm-level data from Germany. Based on these parameter estimates, we then study the nature and extent of the bias in the quantitative welfare effects of offshoring that originates from disregarding the overlap in the data and show how ignoring the overlap affects the relative importance of extensive and intensive margins for explaining observed changes in offshoring.

In the theory section, we set up a stylized two-country model of offshoring, with labour being the only factor of production. The two countries differ in their levels of development and since offshoring is low-cost seeking, it is one directional and leads to production shifting from the more developed source country to the less developed host country. We model production as the assembly of tasks, with firms differing in the number of tasks performed in the production process. The number of tasks is directly linked to firm productivity, reflecting the idea that more tasks allow for a stronger division of labour in the production of goods. Hence, firm heterogeneity is rooted in differences in the task production process and - in line with our data - this gives a positive link between the number of tasks used and the revenues earned by a firm.

¹ Institute for Employment Research (IAB), Nuremberg.

² University of Bayreuth, CESifo, GEP and IfW

³ University of Bayreuth.

⁴ University of Hagen and CESifo.

Since one source of heterogeneity is not sufficient to model overlap in a setting that features selection into offshoring, we assume that firms also differ in the share of tasks that can be offshored to the low-cost host country. We model firm heterogeneity as the outcome of a lottery in which firms draw *two* technology parameters: the number of tasks and the share of offshorable tasks.

The interaction of the two technology parameters determines the pattern of offshoring in our model. It is possible that a firm operating a sophisticated technology with many different tasks finds itself in a position with none of its tasks being offshorable, despite its high productivity and large revenues. However, it is also possible that a firm with a simple technology requiring only few tasks can offshore a significant share of these tasks. This provides a source of overlap, which is rooted in technology and thus exogenous to the firm. To give firms an active role in our model, we assume that offshoring is subject to a fixed cost, and hence the gains from offshoring must be sufficiently high to make it attractive for firms. This makes selection into offshoring a key determinant of overlap. If the fixed costs of offshoring are sufficiently large, offshoring in our model is more attractive *ceteris paribus* for firms operating a technology with more tasks and thus featuring higher revenues.

We use this framework to analyse how changes in variable and fixed offshoring costs affect offshoring and welfare in the source country. A decline in the variable cost of offshoring lowers the price of foreign workers. This makes offshoring attractive for a wider range of producers and increases the volume of tasks imported by incumbent offshoring firms -- because the cost of importing tasks performed abroad makes them more competitive and because they substitute domestically produced tasks for imported ones. Both effects stimulate labour demand in the host country and lead to a rise in foreign wages. However, the increase in foreign wages is of second order and dominated by the initial drop in variable offshoring costs, so that the effective cost of employing foreign workers decreases. This reflects an appreciation of domestic relative to foreign labour and thus an improvement of the (double) *factorial* terms of trade for the source country of offshoring with positive welfare implications. Things are different if the fixed cost of offshoring falls. Whereas this makes offshoring attractive for new producers, the higher foreign labour demand and the resulting increase in host country wages prompt incumbent offshoring producers to reduce the volume of imported tasks. The deterioration of the (double) factorial terms of trade counteracts the direct welfare gain from a lower offshoring fixed cost and this leads to the somewhat counterintuitive result that lifting a technology barrier can actually lower welfare of the source country of offshoring.

In the second part of the paper, we combine three datasets from two different sources. The first one is the Establishments Panel of the Institute for Employment Research (IAB), which provides information on a sample of 16,000 establishments of all branches of the economy and all size categories from annual surveys. In 1999, 2001, and 2003, this dataset also contains information on offshoring activities of German establishments. As a second source of data input, we rely on the 2006 Employment Survey of the Federal Institute for Vocational Education and Training (BIBB) and the Federal Institute for Occupational Safety and Health (BAuA) to construct a measure of task content for 341 occupations. We finally use the Linked Employer-Employee Database from the Institute for Employment Research (LIAB) to aggregate the task composition at the occupation level to the establishment level. This gives a unique dataset for studying offshoring in the context of task production, and we use this dataset to estimate key parameters of our theoretical model, using method of moments.

We estimate the parameters for two model variants: a flexible one, in which we allow for overlap; and a restrictive one, in which we rule out overlap by assumption. We find that the model variant with overlap provides a better fit with the data and show that disregarding the overlap significantly lowers the estimated cost saving from offshoring. This is intuitive, because the model without overlap presumes that all firms that make use of offshoring are high-productivity producers and these firms require a lower cost saving to find offshoring attractive. The discrepancy regarding the estimated cost savings from offshoring generates quantitatively sizable differences in the welfare effects attributed to offshoring by the two models. The model with overlap associates the observed share of offshoring establishments with an increase in German GDP per capita of 18.90 percent. The welfare gain attributed to offshoring falls to 8.73 percent and is therefore 53.81 percent (or more than 10 percentage points) lower in the model variant without overlap.

We finally use our quantitative model to decompose the observed increase of German offshoring openness from 18.03 percent in 1990 to 30.26 percent in 2014 into its *intensive* margin - capturing changes in the offshoring activity of incumbent offshoring firms - and its *extensive* margin - capturing changes in the mass of offshoring firms. We show that both margins contributed significantly to the observed increase of German offshoring, with the intensive margin explaining about 45.17 percent of this increase. Disregarding the overlap, the model would attribute only 17.41 percent of the observed increase in German offshoring openness to the intensive margin and therefore considerably exaggerate the role played by the extensive margin. The model with (without) overlap suggests, moreover, that the increase in offshoring openness between 1990 and 2014 has entailed a welfare increase of 4.77 (2.93)

percent, which amounts to 12.31 (7.56) percent of the overall increase in German GDP per capita over this period.

Elaborating on two important biases that materialize when ignoring the overlap of offshoring and non-offshoring firms in the data, we hope to provide a stimulus for future research on the quantitative effects of offshoring. A promising avenue for extending the analysis in this paper is to allow for firms in the host country, which we have excluded in this paper in the interest of tractability. Such an extension would shed light on the crowding out of local production by foreign labour demand of offshoring firms and would provide a framework for a rigorous welfare analysis in the host country of offshoring. An analysis along these lines would thus be informative on the extent of the bias of the welfare estimates in the host country when ignoring the overlap in the data and thereby complement the analysis in this study.

JEL-Classification: F12, F14, L11