

Comments

Gordon H. Hanson: This paper examines whether inward foreign direct investment (FDI) creates positive spillovers for host countries. This question has generated immense intellectual interest. Many countries demonstrate a strong policy bias in favor of subsidizing multinationals, predicated on the belief that FDI is a source of positive externalities for host-country firms and workers. While this belief has some support in economic theory and in anecdotal evidence, it has not found support in microeconomic-level empirical research. In developing countries, plant-level analysis suggests that the productivity of domestic establishments is low in industries with a large presence of foreign firms.¹ The findings of empirical research are thus at odds with the actions of policymakers.

Alfaro and Rodríguez-Clare propose rethinking the empirical evidence about FDI and spillovers. They correctly observe that much of the empirical literature does not specify a structural relationship between FDI and host-country outcomes and thus may be using reduced-form empirical specifications that are uninformative. They proceed to derive the theoretical conditions under which positive spillovers from FDI obtain and then examine whether this condition is satisfied empirically using plant-level data on manufacturing industries in Brazil, Chile, Mexico, and Venezuela.

Their theoretical framework builds on Rodríguez-Clare (1996), in which the arrival of multinational firms in an industry lowers the price for domestically produced inputs and consequently raises the productivity of domestic plants. These backward linkages amount to a positive spillover from multinationals to domestic firms in the same industry. The existence of positive spillovers requires that domestic inputs are nontraded and that multinationals are sufficiently intensive in their use of intermediate inputs. Alfaro and Rodríguez-Clare find that the second condition is satisfied empirically for Brazil, Chile, and Venezuela, but not for Mexico. For three

1. Aitken and Harrison (1999). Some developed countries, such as Great Britain, present stronger evidence for FDI-related spillovers. See Haskel, Pereira, and Slaughter (2002).

of the four countries in the sample, then, there is evidence consistent with positive spillovers from FDI.

A main contribution of the paper is to show that previous empirical literature misinterprets evidence about input usage by multinationals. The fact that the share of inputs purchased domestically by multinationals tends to be lower than for domestic firms has been viewed as evidence against backward linkages from multinationals. As the authors nicely demonstrate, however, if multinationals are more intensive in the use of intermediate inputs overall, this makes up for the small share of inputs they purchase locally. Thus, the pessimism in the empirical literature about the potential for multinationals to create backward linkages may have been unwarranted.

The paper stops short of estimating the actual magnitude of productivity spillovers associated with backward linkages, although the authors do provide something of a roadmap for how research might proceed. First, a necessary condition for backward linkages is that a large portion of domestic inputs are nontraded. Much of the empirical literature pools data across industries, ignoring the tradability of inputs. Input tradability is thus a key potential source of industry heterogeneity in terms of the sign and size of spillovers. While many inputs used by firms in developing countries are traded (for example, parts and components), many others are not (such as water, power, and some raw materials). An important task for future empirical work is to estimate the tradability of inputs used in developing countries. If most inputs turn out to be tradable, then the previous pessimism on backward linkages may have been warranted.

Second, the theoretical framework of Alfaro and Rodríguez-Clare also suggests a potential source of cross-country heterogeneity in the strength of backward linkages that has been ignored in previous work. In their model, if the intensity of the use of intermediate inputs by multinationals is increasing in the wage-rental ratio, then there could be poverty-trap equilibrium for poor countries.² That is, the condition for positive spillovers may not be satisfied in poor countries (with low wage-rental ratios), because intermediate-input intensity is too low. The arrival of multinationals would then generate negative spillovers, making poor countries

2. More precisely, intermediate-input intensity would have to increase in the wage-rental ratio more strongly for multinationals than for domestic firms. This condition is not all that strong, however, since multinationals are already assumed to have access to foreign inputs to which domestic firms do not.

even poorer. The condition for positive spillovers may be satisfied, however, in rich countries (with high wage-rental ratios). In this case, the arrival of multinationals would raise incomes, making rich countries even richer. This potential extension of their model suggests that multinationals might generate positive spillovers in some economies and negative spillovers in others. Such cross-country heterogeneity in the impacts of FDI would generate much-needed traction for the empirical identification of spillovers. It could also account for the tendency to find evidence of negative spillovers from FDI in developing countries (such as Venezuela) and positive spillovers from FDI in developed countries (such as Great Britain).

One final comment is in order regarding the implications of this paper for tax policy in the developing world. Export processing plants, such as Mexico's *maquiladoras*, are a type of multinational enterprise that receives tax breaks and other fiscal incentives in virtually every country in which they operate. These plants have become the main vehicle through which many developing countries first enter export production. The typical arrangement is for these plants to import intermediate inputs from abroad (duty free), to assemble the inputs into final goods (often with subsidies for the public infrastructure that they require), and to export all output (often subject to minimal corporate income taxation). Given the high tradability and import intensity of the inputs used by these plants, Alfaro and Rodríguez-Clare's model would seem to predict that these plants generate negative spillovers. This brings me back to the disparity between policy and research. The theoretical support for subsidies appears to be weak to nonexistent in the case of what is perhaps the most subsidized form of multinational production. Clearly, the magnitude of spillovers associated with FDI is a research question of first-order policy importance.

Claudio Bravo-Ortega: The literature on the impact of multinational companies contains some interesting results that are worth having in mind when reading Alfaro and Rodríguez-Clare's paper. In particular, Markusen and Venables find that in the absence of microeconomic imperfections, any small FDI project will not have a different impact on the level of welfare of the host economy than that of any domestic firm's investment.¹

1. Markusen and Venables (1999).

A number of imperfections can result in a particular impact from multinational companies to the host economy. The first source of imperfections is the existence of technological externalities, such as knowledge spillovers.² A second mechanism is related to the interaction of multinational companies and fixed distortions in the economy, such as the tax system or labor market imperfections.³ Finally, the existence of imperfectly competitive markets also implies that the arrival of multinational companies would have a particular impact: the increase in competition owing to the entrance of a multinational company can result in price reductions and forward linkages to customer firms or in backward linkages that improve the performance of supplier industries, which in turn can benefit other firms in the same industry as the multinational company.⁴ Alfaro and Rodríguez-Clare study this last sort of imperfection. In particular, they show that the arrival of a multinational company might increase the number of firms and products in the supplier's industrial sector, which increases the total factor productivity of the firms in the industrial sector of the multinational company through a love-of-variety effect.

Alfaro and Rodríguez-Clare's paper uses industrial surveys for Brazil, Chile, Mexico, and Venezuela to apply a theoretical model developed earlier by Rodríguez-Clare.⁵ Consequently, the methodology and the interpretation of the results rely on the model developed in the earlier paper. In this paper, based on the theoretical framework proposed by Rodríguez-Clare, the authors calculate a linkage coefficient as the value of domestic inputs to total workers per year for each firm. The model implies that a higher linkage coefficient for multinational companies will imply backward linkages, and a positive pecuniary externality for firms competing with the multinationals.

The empirical section tests whether the linkage coefficient is higher, on average, for multinational companies than for domestic companies. The main results confirm that this is the case, which could lead to the conclusion that linkage potential exists in the economies under study. The

2. See, for example, Branstetter (2000).

3. For an interesting review of the impact of multinationals in the labor market, see Lipsey (2002); for a formalization of labor market spillovers, see Fosfori, Motta, and Ronde (2001).

4. See Hirschman (1958) for the introduction of the concept of linkage and Rodríguez-Clare (1996) for a theoretical formalization.

5. Rodríguez-Clare (1996).

authors then subject the main result to several robustness checks that are generally in line with the main conclusion.

A New Approach to an Old Question

In their review of the methodological problems inherent in the existing literature, the authors identify measurement error in the traditional productivity regressions. The literature does not generally observe physical outputs, but rather captures plants' nominal sales revenue, inventory changes, and industry price indexes. Similarly, if input quantities are not observed, the convention is to replace them with a deflated measure of expenditure on inputs. These approximations imply measurement error in the left- and right-hand-side variables of traditionally estimated regressions that try to capture the impact of multinational companies on the productivity of domestic firms. The existence of a measurement error in the left-hand-side variable implies lower precision on the estimates of the coefficients in the regression; measurement error in a right-hand-side variable would generally imply an attenuation bias on the estimated coefficients. This methodological limitation thus makes it more difficult to find meaningful estimations of the effect of multinational companies on productivity. Even so, some recent literature still finds an impact of multinational companies on the productivity of firms in the host economy.⁶

Can the aggregation of input and output be considered a measurement error, or are the implications even more far reaching? In a very provocative paper, Katayama, Lu, and Tybout show that the use of traditional measures of output and input might induce misleading conclusions regarding productivity.⁷ These authors show that the traditionally estimated measures of productivity are proportional to real factor costs and completely unrelated to productivity. This dependence on factor prices may undermine productivity analysis in a number of ways. Katayama, Lu, and Tybout claim that the common finding that small and new firms are relatively unproductive may partly reflect that they pay lower wages than large firms. In the same manner, the tendency to find high productivity among research and development (R&D) firms and multinationals may partly reflect high unit labor costs. The paper by Katayama, Lu, and Tybout invites us to look with caution at the existing evidence on the

6. For recent evidence, see Smarzynska (2002).

7. Katayama, Lu, and Tybout (2003).

impact of multinationals on productivity. One important merit of the paper by Alfaro and Rodríguez-Clare is to develop an innovative way to bypass the shortcomings of the traditional approaches that Katayama, Lu, and Tybout outline.

Model Uncertainty and the Interpretation of the Results

In this paper the authors work with an intermediate index, in which a higher value for multinational companies than for domestic firms implies linkage potential. However, this implication relies on a set of assumptions that does not necessarily hold for all the industrial sectors in the host economy. For example, as discussed in the paper, the implications of the model do not hold if some of the intermediate goods used by domestic firms are tradable or if these goods are produced under constant returns to scale. Finally, the assumptions regarding the labor market are also discussed. In particular, if skilled labor is sector specific and unskilled labor is mobile across sectors, the linkage coefficient should be calculated as the ratio of inputs bought domestically to the number of skilled workers.

I see another possible specification for the linkage coefficient, based on the labor-market side of the model. The paper states that multinational companies probably hire more skilled workers than domestic firms, and the literature confirms that multinationals pay higher wages than local firms (in exchange for higher productivity, even if these are efficiency wages). If the skill level is proxied by the level of human capital, under fairly general assumptions this would imply that multinationals hire fewer workers, which would lead to a higher linkage coefficient, but not necessarily to higher linkages. Suppose, for example, that the production function can be expressed as follows:

$$Q_{si} = \delta(n) \cdot (h_i L_i)^\beta \cdot X_i^{1-\beta},$$

where i represents multinationals or domestic firms. In the case of equal betas across firms, if $h_{\text{MULTINATIONAL}} > h_{\text{DOMESTIC}}$, then for a given wage rate $L_{\text{MULTINATIONAL}} < L_{\text{DOMESTIC}}$. For this particular specification, the appropriate measure of linkages is inputs bought domestically over total wages.

The authors report that the linkage coefficient is higher, on average, for multinational companies than for domestic companies, which could lead to the conclusion of a linkage potential in the economies under study. However, this general result might reflect different sources of heterogene-

ity. In particular, table 6 (regression 2) shows that in Venezuela, older multinationals demonstrate linkage potential, while newer firms have a negative linkage potential. In other words, new firms have a negative impact on the productivity of other firms in their industrial sector. This suggests a maturity effect: the longer a multinational company has been in the host economy, the larger the fraction of inputs it demands domestically, as is shown in table 7.

Hirschman, in his original work, finds different levels of forward and backward linkages across industries.⁸ The industrial sectors with low linkages tend to be associated with natural resources. I suggested to the authors that they test for heterogeneity across sectors. They very kindly agreed to carry out the computations, and the results are reported in tables 10 and 11. Table 10 displays important heterogeneity not only across sectors, but also across countries. For Chile, all but two sectors exhibit important and significant linkage potential. The results are mixed for Mexico and Venezuela, in some cases showing significant negative linkage potential.

Table 11 shows that exporting firms have greater linkage potential than firms oriented toward the domestic market. This result is important from a policy perspective. If a country wished to create incentives to attract multinational companies, those incentives should target exporting firms. This result is in line with the theoretical predictions of Markusen and Venables on the impact of export-oriented multinationals.⁹

A Final Comment

The results reported in this paper pose an interesting set of unresolved questions. A central issue involves how to reconcile the results with the existing evidence of a negative impact from multinationals on the productivity of local firms in the same industrial sector. In answering this question, an important intermediate step would be to quantify the model's implied magnitude of the positive impact of multinationals on the TFP growth of other firms in their industrial sector through the increase in the variety of inputs. In short, the most important challenge facing researchers dealing with the impact of multinationals may be how to identify empirically the different channels through which this materializes, together with the magnitude of each.

8. Hirschman (1958).

9. Markusen and Venables (1999).

TABLE 10. Linkage Coefficient by Sector^a

<i>Explanatory variable</i>	<i>Chile</i>	<i>Mexico</i>	<i>Venezuela</i>
FOREIGN	3,062.7 (8.89)***	189.2 (1.11)	1,010.3 (0.78)
Food, beverages, tobacco × FOREIGN	3,977.0 (7.35)***	-273.3 (-1.26)	-997.1 (-0.44)
Wood products × FOREIGN	795.2 (0.96)	-24.5 (-0.14)	-2,885.1 (-2.10)**
Paper products × FOREIGN	5,958.2 (6.42)***	-93.0 (-0.54)	4,022.4* (2.10)**
Chemicals × FOREIGN	412.6 (0.12)	-187.6 (-1.09)	5,984.8 (1.53)
Nonmetallic products × FOREIGN	5,460.1 (5.13)***	-258.3 (-1.50)	-1,853.7 (-1.21)
Metal × FOREIGN	115,054.9 (5.17)***	-425.6 (-2.25)***	-8,906.8 (-3.20)***
Machinery × FOREIGN	1,610.6 (3.45)***	-166.2 (-0.97)	362.6 (0.26)
Other × FOREIGN	-163.0 (-0.28)***	-230.6 (-1.34)	-2,930.6 (-1.87)*
<i>Summary statistic</i>			
No. observations	65,812	47,065	13,724
R ²	0.1	0.1	0.1

* Statistically significant at the 10 percent level; ** at the 5 percent level; *** at the 1 percent level.

a. The dependent variable is the linkage coefficient for exporting firm *i*, defined as the value of inputs bought domestically to total workers. All regressions are estimated using OLS with White's correction of heteroskedasticity and include time and industry dummies. FOREIGN is a dummy variable for foreign ownership. The reference sector is textiles (ISIC32). For Chile, Mexico, and Venezuela, industry dummies correspond to two-digit ISIC classification; *t* statistics are in parentheses.

TABLE 11. Linkage Coefficient for Exporting Firms^a

<i>Explanatory variable</i>	<i>Chile</i>	<i>Mexico</i>	<i>Venezuela</i>
D_EXP	7,062.4 (6.99)***	60.0 (1.50)	3,367.7 (5.37)***
<i>Summary statistic</i>			
No. observations	65,812	4,776	13,724
R ²	0.1	0.1	0.1

*** Statistically significant at the 1 percent level.

a. The dependent variable is the linkage coefficient for exporting firm *i*, defined as the value of inputs bought domestically to total workers. All regressions are estimated using OLS with White's correction of heteroskedasticity and include time and industry dummies. D_EXP is a dummy variable for exporting firms. Data are in local currency, for Venezuela in thousands; *t* statistics are in parentheses.

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