Job Multipliers: A Global View[1]

William Maloney[2] Josefina Posadas[3] Temel Taskin[4]

January 2022

Abstract

This paper estimates job multipliers—the average number of non-traded sector jobs created for every new traded sector job—across a large set of developed and developing economies. The traded/non-traded multiplier is found to decline with level of development ranging from 3 in low/lower-middle income countries to -.25 in high income countries, plausibly for reasons consistent with Moretti (2010): declining relative traded/non-traded productivity and relative skill levels and increasing general equilibrium offsets as income rises. Traded/traded multipliers show a weak positive association with development, arguably pointing to stronger agglomeration economies in developed countries. We also find strongly *positive* informal job multipliers, paradoxically suggesting that increased traded employment may expand informality and hence the latter cannot be considered purely a sector of disguised unemployment.

Keywords: Job multipliers, Labor demand, Job creation, Development, Development policy.

JEL Codes: J23; R11; R12; R23.

[1] The views expressed here belong to the authors and should not be interpreted as the official views of the World Bank or Bank of Canada.

[2] World Bank, Chief Economist, Latin America and Caribbean Region. Email: wmaloney@worldbank.org

[3] World Bank, Senior Economist, Social Protection and Labor, Human Development Practice. Email: jposadas@worldbank.org

[4] Bank of Canada. Email: ttaskin@bankofcanada.ca

1. Introduction

Vast sums are spent to create jobs in lagging regions through infrastructure projects or incentive packages to attract firms such as tax breaks, concessional land deals, wage subsidies, job training facilities or transport support. For example, Mercedes Benz received a USD 250 million incentive package (USD 165,000 per direct job created) to locate in Vance, Alabama (Greenstone and Moretti, 2003); and Boeing obtained USD 50 million (USD 50,000 per direct job created) in tax savings to locate its corporate headquarters in Chicago (Mitol, 2001; Trogen, 2002). Developing countries similarly pursue such deals to attract foreign direct investment (FDI) or a segment of a global value chain (see, for example, Cavalho, Lall and Timmins, 2006; World Bank, 2020). The jobs multiplier—how many additional jobs will be created for a job attracted or created by such programs—determines the cost per all related jobs created and is a central parameter for project appraisal.

Yet, there is substantial variance in the few comparable estimates for the advanced countries, and there are no estimates for the developing world. In the last decade, Moretti (2010) has popularized a multiplier measuring the impact of a new job in traded sectors on nontraded jobs employing Bartik's (1991) shift-share instrument to account for possible endogeneity concerns. While he finds for the United States that an additional job attracted in these traded industries could create additional 1.6 jobs in non-traded industries, Moretti and Thulin (2013) find only a third as large an impact in Sweden, implying a much lower return per job created in traded sector (see also Bartik, 2020; Bartik and Sotherland, 2019).

This paper presents comparably estimated multipliers from 42 countries across the development spectrum. We first use a harmonized cross-country census database (Minnesota Population Center, 2020) to calculate job multipliers for both non-traded and traded sectors. Our results reveal a sharply declining relationship of job multipliers

and per capita income: traded on non-traded (T/NT) multipliers average 3 in low and lower middle-income countries and fall to average of -0.25 in high income countries. We also show a less dramatic but significant increase in traded on traded multipliers with development. As we are particularly interested in the labor market dynamics in developing countries, we further examine the multiplier of a new formal traded sector job on informal vs. formal non-traded jobs. Importantly, the sign of the traded/informal sector multiplier is always positive, suggesting formal and informal markets cannot be taken as segmented as a first approximation , and that traded sector job creation may counterintuitively expand informal employment, confirming the recent theoretical findings highlighted in Dix-Carneiro, Goldberg, Meghir, Ulyssea (2021).

2. Approach and econometric specification

Moretti (2010) offers a simple model based on a standard set of assumptions similar to those used in open-economy models of trade but applied to the domestic economy that offers insights into why multipliers may vary by context. Each local market produces two types of goods, namely, traded (T) and non-traded (NT). The price of traded goods is set by the international market, while the price of non-traded goods is determined by the local market with some room for upward adjustment. Local labor markets are competitive, and labor is perfectly mobile within the local market, hence it can be reallocated between the two sectors at no cost. This assumption ensures that in the long-run wages are equalized for workers in the traded and non-traded sectors within a local market. Workers can move freely across local markets and make decisions based on wages and cost of living (i.e. prices of non-traded goods and housing) as well as individual preferences. This results in an upward sloped local labor supply curve. Firms are also mobile, and location is part of the profit maximization decision. A rise in employment in the traded sector will lead to higher incomes and hence higher demand for non-traded such as restaurants, real estate, personal and business services, and

beyond; this is captured in the T/NT multiplier. Since traded sector firms are international price takers, higher wages may lead to "crowding out" other traded employment as jobs move to other areas or disappear. Hence, T/T multipliers are expected to be lower than T/NT multipliers. This effect may be attenuated if increased agglomeration leads to countervailing gains in productivity (Moretti, 2010; Greenstone et al., 2010; Bartik and Sotherland, 2019).[5]

Effect of traded sector employment on non-traded sector employment. We follow Moretti's (2010) econometric specification to estimate T/NT multipliers by relying on the reduced form:

$$\Delta E_{ct}^{NT} = \alpha + \beta \Delta E_{ct}^{T} + \gamma d_t + \varepsilon_{ct} \qquad (1)$$

where ΔE_{ct}^{NT} and ΔE_{ct}^{T} are the changes in the number of non-traded $\left(E^{NT}\right)$ and traded $\left(E^{T}\right)$ jobs in the period between t and $t-s$, in the local labor market (city or province) c; d_t is a dummy vector to indicate the time period, and ε_{ct} is the error term. The time dummy vector is added to control for national shocks that could affect employment in all traded sectors.

Estimating equation (1) by OLS is likely to yield inconsistent estimates of β, the corresponding multiplier. On the one hand, increases in employment in the non-traded sector can reduce traded employment via higher wages, overestimating the job multiplier. For example, if there is positive shock to the non-traded sector, employment in the traded may be reduced if workers reallocate across sectors. Further, there may be local shocks that affect employment in both traded and non-traded sectors. For instance, a change in local taxes or in the provision of public local goods will affect the desirability

[5] Bartik and Sotherland (2019) confirm Moretti's finding that multipliers for high-tech sectors were higher than others at 2.9 relative to 1.5, but further argue that they are substantially lower (1.7) as the share of employment in high-tech clusters falls.

of living in a certain city and affect employment independent from the sector. The direction of possible bias cannot be signed a priori as it depends on the underlying responses of each sector. Hence, Moretti (2010) instruments the change in the number of traded jobs by a prediction based on the employment in the traded sector at the beginning of the period in each local market and each industry and the growth at the national level in each industry (Bartik, 1991). Formally, the instrument proposed for ΔE_{ct}^{T} is:

$$\sum_{j} E_{c,j,t-s}^{T} \left[ln\left(E_{j,t}^{T} - E_{c,j,t}^{T}\right) - ln\left(E_{j,t-s}^{T} - E_{c,j,t-s}^{T}\right) \right] \quad (2)$$

where $E_{c,j,t}^{T}$ is the number of traded jobs at time t in the local labor market c, and in industry j; and $E_{j,t}^{T}$ is the number of traded jobs at time t in national industry j. The instrument, thus, excludes any shock that could be affecting the employment in the traded sector in district c and that could also be affecting employment in the non-traded sector in the same place. Thus, all the effect of a common shock is captured by the error term. Variations of equation (1) can be estimated to understand different mechanisms at play behind the job multiplier.

Effect of traded sector employment on other traded sectors. Analogously, for traded and traded multipliers we estimate:

$$\Delta E_{ct}^{T1} = \alpha + \beta \Delta E_{ct}^{T2} + \gamma d_t + \varepsilon_{ct} \quad (3)$$

where ΔE_{ct}^{T1} is the change in the number of jobs between t and $t-s$ in one randomly selected traded sector group in district c, and ΔE_{ct}^{T2} is the change in the number of jobs between t and $t-s$ in the rest of the traded sectors in district c. In equation (3), the term ΔE_{ct}^{T2} is instrumented following the same logic applied in equation (2).

Table 1. Data sources

Data source	Data type	Variables	Time coverage	Country coverage
IPUMS	Micro: individual level.	Employment status, location, working industry.	1960-2015: varies across countries.	Argentina, Austria, Benin, Bolivia, Botswana, Cambodia, Canada, Chile, China, Costa Rica, Dominican Republic, Ecuador, Egypt, Ethiopia, Fiji, France, Greece, Guatemala, Honduras, Indonesia, Ireland, Jamaica, Kenya, Malaysia, Mali, Mexico, Morocco, Nicaragua, Panama, Paraguay, Portugal, Puerto Rico, Romania, Spain, Thailand, Trinidad and Tobago, Turkey, Venezuela, Vietnam, Zambia.
I2D2	Micro: individual level.	Employment status, location, working industry, social security status.	1970-2017: varies across countries.	Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Paraguay, Peru, Uruguay, Venezuela.
WDI	Macro: country level.	Per capita GNI, agricultural employment.	1970-2018: varies across countries.	Matches IPUMS sample.
Dieppe (2020)	Macro: 12-sectors.	Labor productivity, value added.	1975-2018: varies across countries.	Matches IPUMS sample.

Note: Table summarizes the data sources and coverage. For country-specific details, see the Appendix.

3. Data

The Integrated Public Use Microdata Series (IPUMS) International database harmonizes anonymized population censuses conducted by national authorities.[6] Our sample includes 42 countries with panel coverage varying between 1960 and 2015. The samples usually span 5-10 years between each available census wave. Selection of countries is based the availability of employment status, working industry, and location variables

[6] Micro datasets are obtained from Minnesota Population Center (2020).

for at least three years which we need to construct the variables used in our benchmark regressions.

We used the harmonized variables across samples for both location and industry indicators. Industry is classified by 14-sectors as harmonized by IPUMS: Agriculture, mining and extraction, manufacturing, utilities, construction, wholesale and retail trade, hotels and restaurants, transportation, financial services, public administration, business services, education, health and social work, and private and household services. Agriculture, mining and extraction, and manufacturing are classified as traded industries, while the remainder are classified as non-traded, following Moretti and Thulin (2013). The instrumental variable for traded sector employment shock is constructed using the three subsectors: agriculture, manufacturing, and mining and extraction as described in the previous section.[7]

Geographical variables represent major administrative units and are harmonized to provide spatially consistent boundaries across samples in each country. Table 1 summarizes the sources and Table A1 provides more detail at the country level.

The IPUMS does not have an indicator of informality so we draw on the World Bank International Income Distribution Database (I2D2) which harmonizes information from household surveys for labor market analysis.[8] A consistent and well-accepted measure of informality—registration with social security authorities—is available for the majority of the Latin America and Caribbean (LAC) region which gives us a sample of 14 countries.

[7] Moretti and Thulin (2013) use two and three-digit subsectors to construct the instrumental variable for the United States and Sweden. However, most countries do not have that level of sectoral disaggregation in the IPUMS. Therefore, we use the three subsectors of the traded sector—agriculture, manufacturing, and mining and extraction—to build the instrumental variables that are consistent across countries.

[8] For further details, see Montenegro and Maximilian (2009).

Aggregate variables—including per capita income, sectoral labor productivity and value added—are obtained from World Development Indicators and Dieppe (2020). For income, we use per capita Gross National Income (GNI), measured by ATLAS method of the World Bank which is updated annually and employed for official income classification across countries.[9] For each sector, real labor productivity equals real value added—measured in constant local currency prices—divided by the number of workers. Nominal value added is deflated by sectoral price indices when available, and by aggregate price indices otherwise. Agricultural employment is measured as share of total employment. Non-traded value-added share is proxied by the share of service sectors in total nominal value added.

4. Estimates of job multipliers

Country-specific estimates of the T/NT multipliers are presented in Table 2. The number of harmonized geographical units used in the exercises ranges from 12 for Fiji to 3,369 for Brazil. The OLS and IV estimates differ significantly within countries, sometimes of important magnitudes. 24 of the 42 countries show coefficients significant at least at the 10% level. Plotting these coefficients against income per capita (Figure 1a) reveals a statistically significant negative slope with just significant estimates and will all. Among the significant, Austria, Canada, France, Greece, and Italy all show negative values while Costa Rica, Ecuador, Malaysia, Morocco, and Paraguay all show values above 2. The average multiplier is 3 for low/lower middle-income countries, 1.9 for upper middle-income countries, and -.25 for high income countries.[10]

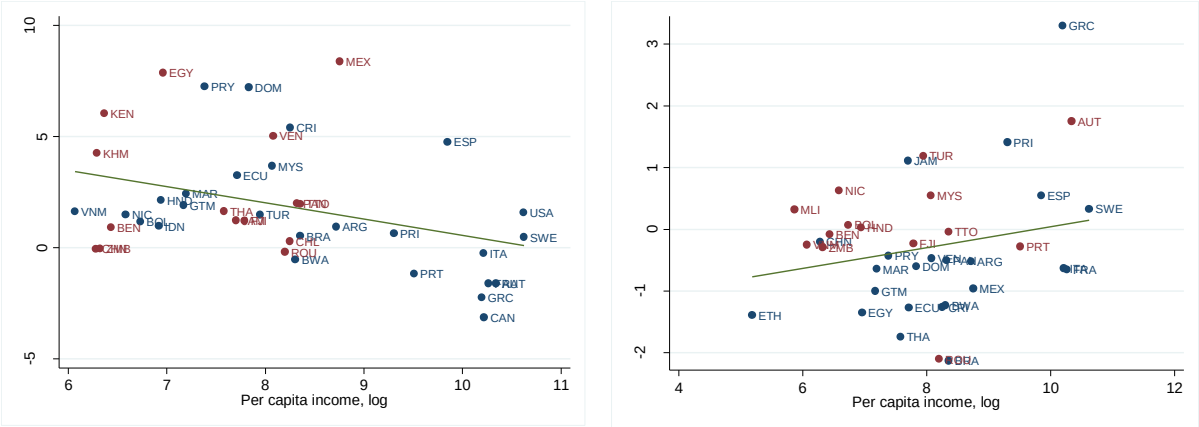
[9] See World Bank (2021) for a detailed description of the ATLAS methodology.
[10] The changes in employment in this paper does not differentiate with respect to the quality of jobs, which might differ across countries and be reflected in job multipliers. See Merotto, Weber, and Aterido (2018) for a discussion on the quality of jobs across a large number of developing countries.

Table 2. Country-specific estimates

	T/NT multiplier					T/T multiplier				
a)	**OLS**		**IV**		**N**	**OLS**		**IV**		**N**
Argentina	0.71***	[0.03]	0.94***	[0.03]	72	-0.23***	[0.03]	-0.52***	[0.06]	72
Austria	-1.09***	[0.07]	-1.61***	[0.15]	124	0.69	[0.65]	1.75	[1.96]	124
Benin	0.00	[0.13]	0.92	[0.96]	45	-0.85***	[0.05]	-0.08	[0.91]	45
Bolivia	1.41**	[0.52]	1.17**	[0.6]	38	0.94***	[0.33]	0.07	[0.4]	38
Botswana	0.45*	[0.26]	-0.53*	[0.32]	42	-1.07***	[0.19]	-1.23*	[0.71]	42
Brazil	0.43***	[0.04]	0.53***	[0.08]	3217	-0.53***	[0.02]	-2.13***	[0.47]	3135
Cambodia	-0.01	[0.09]	4.26	[4.9]	123	-0.79	[0.64]	-42.18	[107.52]	111
Canada	-2.98***	[0.28]	-3.14***	[0.48]	30	1.17	[1.31]	6.66	[6.74]	30
Chile	0.70**	[0.33]	0.29	[0.21]	85	-0.19***	[0.06]	-26.21	[178.16]	85
China	0.07	[0.07]	-0.05	[0.05]	66	-0.13***	[0.03]	-0.20***	[0.03]	66
Costa Rica	1.42***	[0.39]	5.40***	[1.71]	36	-0.78***	[0.16]	-1.26***	[0.22]	36
Dominican Rep.	5.13***	[1.23]	7.22***	[1.55]	72	-0.41**	[0.17]	-0.60***	[0.14]	72
Ecuador	3.31***	[0.19]	3.26***	[0.04]	60	-0.80***	[0.01]	-1.27***	[0.15]	61
Egypt	0.74***	[0.11]	7.87	[7.95]	48	-0.34**	[0.15]	-1.35***	[0.19]	48
Ethiopia	0.76***	[0.15]	14.91	[29.23]	51	-0.44***	[0.13]	-1.39***	[0.22]	51
Fiji	-0.45	[0.48]	1.21	[2.26]	12	-0.12	[0.14]	-0.23	[0.37]	12
France	-0.82	[0.71]	-1.61***	[0.38]	91	-0.51***	[0.09]	-0.65***	[0.06]	91
Greece	-1.23***	[0.18]	-2.24***	[0.48]	153	-0.48***	[0.11]	3.30*	[1.98]	153
Guatemala	1.23***	[0.36]	1.91***	[0.2]	104	-1.05***	[0.18]	-1.00***	[0.11]	104
Honduras	1.52***	[0.37]	2.14**	[0.86]	38	0.02	[0.06]	0.03	[0.06]	37
Indonesia	0.74***	[0.12]	0.98***	[0.19]	90	0.19***	[0.04]	5.19	[5.44]	90
Ireland	-1.36	[1.07]	-20.12	[40.63]	32	0.04	[0.1]	-1.93	[39.18]	32
Jamaica	1.24	[0.85]	1.23	[1.38]	28	0.25**	[0.11]	1.11**	[0.56]	28
Kenya	1.86***	[0.29]	6.05	[5.05]	303	-0.11	[0.15]	6.42	[9.47]	318
Malaysia	2.80**	[0.97]	3.68***	[0.71]	33	0.03	[0.21]	0.55	[0.47]	33
Mali	0.04	[0.2]	-0.55	[1.37]	16	0.02	[0.07]	0.32	[0.87]	16
Mexico	1.23	[0.97]	8.38	[5.13]	64	-0.86***	[0.05]	-0.96***	[0.06]	64
Morocco	0.49**	[0.21]	2.43**	[1.13]	32	-0.45***	[0.07]	-0.64***	[0.15]	32
Nicaragua	0.89	[0.58]	1.49*	[0.86]	26	-0.04	[0.13]	0.63	[0.49]	26
Panama	1.85	[1.67]	2	[2.25]	35	-0.41***	[0.06]	-0.50***	[0.04]	35
Paraguay	1.09*	[0.51]	7.26*	[4.13]	56	-0.25	[0.16]	-0.43***	[0.09]	56
Portugal	-0.71**	[0.21]	-1.17***	[0.08]	21	-0.32	[0.19]	-0.28	[0.33]	21
Puerto Rico	0.90***	[0.05]	0.65***	[0.04]	18	1.43***	[0.1]	1.41***	[0.03]	18
Romania	-0.23	[0.29]	-0.19	[0.96]	16	-0.83***	[0.11]	-2.1	[1.99]	16
Spain	4.80***	[0.59]	4.76***	[0.51]	72	0.52***	[0.09]	0.55***	[0.12]	72
Thailand	0.21	[0.2]	1.64	[1.68]	204	-0.84***	[0.02]	-1.74**	[0.78]	204
Turkey	1.15***	[0.14]	1.48***	[0.09]	124	0.53**	[0.24]	1.19	[0.95]	124
Venezuela	1.05*	[0.57]	5.03	[3.58]	48	-0.45***	[0.09]	-0.47***	[0.11]	48
Vietnam	0.56*	[0.29]	1.63***	[0.22]	76	-0.70***	[0.17]	-0.25	[0.33]	76
Zambia	0.02	[0.06]	-0.04	[0.11]	16	0.03	[0.02]	-0.29	[2.4]	16
b)			**Average**					**Average**		
LIC/LMIC			3					-0.83		
UMIC			1.9					-1.13		
HIC			-0.25					-0.1		

Source: Authors' calculation, Minnesota Population Center (2020, IPUMS).
Note: Table presents estimated coefficients of traded on non-traded job multipliers using equation (1). Robust and clustered standard errors are shown in brackets. ***, **, and * indicate 1, 5, and 10% significance levels. The multipliers for ITA is borrowed from Blasio and Menon (2011), and for SWE and USA from Moretti and Thulin (2013).

Figure 1. Per capita income and job multipliers



(a) Traded on non-traded **(b) Traded on other traded**

Source: Authors' calculation, Minnesota Population Center (2020, IPUMS), World Bank (2021, World Development Indicators).

Note: The graph presents estimated coefficients of traded on non-traded job multipliers using equation (1). The multipliers for ITA is borrowed from Blasio and Menon (2011), and for SWE and USA from Moretti and Thulin (2013). Per capita income is measured using Gross National Income in current U.S. dollar (ATLAS method). For each country, it reflects the sample mean over the period of IPUMS data coverage. The blue markers indicate countries where the estimated job multiplier is statistically significant, and the red ones are statistically insignificant. Outliers are removed from both charts for visual purposes.

The last three columns of Table 2 present the estimated T/T multipliers. Figure 1 plots the substantially fewer (12) significant values, and the non-significant show substantially more dispersion. As expected, among the significant estimates, the average values are a fraction of the T/NT multipliers: -.83 for low/lower middle-income countries, -1.13 for upper middle-income countries, and -.13 for high income countries. The variance among the significant estimates is also correspondingly lower, ranging from -2 to 1.4 as opposed to -3 to 7 for the T/NT multiplier. Figure 1 and Table 3 also suggest a significant upward relationship with income per capita among the significant estimates.

4.1. Drivers of the link between T/NT multipliers and income

Moretti (2010) highlights several competing factors as determinants of the job multipliers. We discuss how these factors could lead to the observed patterns in job multipliers across the development spectrum.

Worker preferences for non-traded vs. traded goods, and technology of production in the non-traded sector. Clearly, the larger the share of the marginal income generated in the traded sector that is spent on non-traded goods and services, the larger the multiplier, all else equal. Further, the increased consumption will lead to a larger increase in non-traded sector labor demand the more labor intensive the non-traded technology. The effect of preferences would seem an implausible candidate given the well documented increase in demand for services with development.[11] As a proxy for the demand for services, we use the share of service sectors in total value added.

Skill intensity of jobs created in the traded sector. The higher the skill level and hence wages of new traded jobs created, the greater the demand of non-traded goods and services will be. As Moretti describes, high wage jobs tend to be more common in the high-tech sector that may arise from higher levels of human capital required. On the other hand, clearly a higher skilled non-traded sector offsets this effect. How the relative skill intensity and technology of production affects work over development is potentially an important determinant of how the multiplier evolves albeit not a priori clearly how: It is not uncommon, for instance, for educated executives in low wage countries to have multiple permanent household staff, while comparable professionals in advanced countries may afford at best a part time cleaning person. Hence, the marginal traded "high tech" job in a relatively poor country may have a very large multiplier indeed. On the other hand, if the investment or segment of a global value chain attracted

[11] See Van Neuss (2019) for a recent survey of research on the rising share of services in economic activity.

specializes in low level assembly operations or basic agricultural production, the multiplier will be lower.

Table 3. Correlates of job multipliers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	T/NT	**T/NT(-)**	**T/NT**	**T/NT**	**T/NT**	**T/T**	**T/T(-)**	**Infor. T/NT**	**Form. T/NT**
Per capita inc.	-0.73**	-0.85***	-1.26*	-1.34		0.09	0.43*	-0.52***	-0.09
	(0.281)	(0.295)	(0.629)	(0.795)		(0.307)	(0.230)	-0.069	-0.396
T/NT prod.			3.04***	3.09***	3.65***				
			(0.807)	(0.820)	(0.775)				
Agri. emp. share			-6.50	-6.44	-0.93				
			(4.314)	(4.334)	(2.426)				
NT output share				1.35	-5.03				
				(5.912)	(5.090)				
Observations	41	26	34	34	34	39	22	14	11
R-square	0.13	0.22	0.39	0.39	0.34	0.00	0.19	0.32	0.01

Source: Authors' calculations, Dieppe (2020), Minnesota Population Center (2020, IPUMS), World Bank (2021, World Development Indicators).
Note: Table reports estimated coefficients of linear trends presented in Figures 1 to 4. Robust standard errors reported in parentheses. Statistical significance reflected as follows: *** p<0.01, ** p<0.05, * p<0.1. Samples of estimations in columns (2) and (7) exclude countries that have insignificant multipliers, the rest of the columns include all observations.

To proxy the relative skill intensity and technology of production we use the relative T/NT labor productivity, constructed as the ratio of labor productivity (real value added per worker) between the two sectors. Column (2) of Table 3 includes the T/NT productivity ratio, showing a strong and significant coefficient in the predicted direction, the higher relative traded sector productivity, the higher the multiplier. The estimated coefficient of relative productivity implies that Moretti's differential estimates for high-tech and low-tech T/NT job multipliers in the United States apply broadly in a large sample of countries.

General equilibrium effects. Multipliers will depend importantly on the size of offsetting general equilibrium effects working through labor market tightness and housing supply which differ vastly across income levels. Classic labor surplus models (Lewis, 1939 and 1984; Fei and Ranis, 1964) postulate very poor countries have an infinite elasticity of labor supply coming from under-employment in the rural areas, and the vast informal housing sector in cities suggests that, at early stages of development, housing is reasonably elastic as well. Hence, upward pressure on wages in response to a marginal increase in traded sector employment is likely to be low but will increase with development as surplus labor is absorbed thereby reducing the multiplier.[12] Column 3 includes the share of the share of agricultural jobs in total employment and it does not enter significantly while relative productivity remains strongly significant.

This labor supply explanation seems further blunted by the fact that we find no significant decrease in the T/T multiplier as, all things equal, we would expect if the economy wide labor supply elasticity were very high in poorer countries. As Moretti suggests, because tradable industry prices are disciplined internationally, the rise in wages arising from expansion of one traded industry lowers the competitiveness of other traded industries in the same location, an effect that would be mitigated by an elastic labor supply curve. While the absence of any effect of agricultural employment on the T/NT multiplier calls into question the important of this source of slack for either sector, it may also be that agricultural workers are less close substitutes for traded jobs than non-traded jobs.[13] The upward slope seen in Figure 1 may instead by driven by the dominating effect of agglomeration economies- the presence of more traded employers

[12] Increasingly generous unemployment benefits (or social expenditures in general) that raise the reservation wage, more rigid labor market regulations, or decreasing interregional labor mobility, all of which appear to accompany development, have the same dampening effect on labor supply elasticities. Low taxes on property transactions or active property rental markets contribute to diminishing the cost of moving and facilitate labor reallocation although how this may change with development is less clear.

[13] This is consistent with the standard Harrod and Todaro (1970) theory of informality and development, which argues that agricultural workers migrate to cities and park in the non-traded informal sector.

in a location increases the productivity of all- that would increase across the development process.

4.2. Formal vs informal sector multipliers

Informal (unprotected) labor is very prevalent in the developing world and its reduction is a common policy objective. Hence, we explore here the traded/informal non-traded (T/NT_i) multiplier. The exercise also sheds light on a long-standing debate about the role of informality.

To the degree that the informal sector is the disadvantaged sector of a segmented labor market (for example, Mazumdar, 1983) and effectively disguised unemployment, we would expect the multiplier to be negative as increased demand in the traded sector draws from this pool and hence reduce the number of "jobs" in the informal non-traded sector. However, to the degree that informal firms and labor arise from a choice between being, for example, in a formal salaried job or being voluntarily self-employed, albeit with limited interaction with the state, and not labor market segmentation[14] then we may expect the T/NT_i multiplier to be positive as with any other non-traded job (see Fiess et al., 2010). In a recent paper, Dix-Carneiro, Goldberg, Meghir, Ulyssea (2021) build a quantitative macro model and show that the increased income in traded sector due to trade openness induced employment raises the demand for goods and services in non-traded sector, attracting entry of new informal firms and raising employment in this sector. Our informal sector job multipliers present an opportunity to cross-validate these channels.

[14] See Maloney (2004) for a general statement, Falco et al. (2015) for Africa; Bosch, Goni-Pacchioni, and Maloney (2012) for Latin America.

Table 4. Informal and formal T/NT multipliers

(a)	T/NT_i					T/NT_f				
	OLS		IV		N	OLS		IV		N
Argentina	1.46***	[0.09]	1.40***	[0.22]	250	2.80***	[0.91]	3.18***	[0.89]	250
Bolivia	0.64	[0.69]	1.18***	[0.22]	138	0.34	[0.32]	0.23	[0.15]	138
Brazil	0.16	[0.1]	0.48***	[0.07]	394	0.01	[0.09]	0.36**	[0.18]	394
Chile	0.37***	[0.08]	0.31*	[0.17]	153	0.79**	[0.26]	1.49***	[0.26]	153
Colombia	0.18***	[0.06]	2.85	[9.38]	389	0.16*	[0.09]	4.98	[16.89]	389
Costa Rica	0.43*	[0.21]	0.81*	[0.49]	56	0.5	[0.29]	-0.01	[0.56]	56
Dominican Rep.	0.32**	[0.15]	0.94*	[0.51]	93	-0.36	[0.36]	-0.53	[0.58]	93
Ecuador	0.75***	[0.16]	0.93***	[0.25]	130	1.68***	[0.3]	1.71***	[0.21]	130
El Salvador	0.12*	[0.06]	0.36***	[0.1]	192	0.78**	[0.31]	1.16***	[0.29]	192
Guatemala	1.17***	[0.39]	1.76***	[0.11]	83	0.85**	[0.36]	1.34***	[0.19]	83
Honduras	0.80**	[0.36]	1.35***	[0.4]	372	0.09**	[0.04]	0.16**	[0.06]	372
Mexico	1.03***	[0.15]	1.24***	[0.21]	248	0.76***	[0.16]	0.94***	[0.29]	248
Nicaragua	1.50***	[0.2]	1.43***	[0.16]	34	1.40***	[0.23]	1.34***	[0.12]	34
Paraguay	1.62***	[0.16]	1.86***	[0.08]	257	0.78***	[0.04]	0.89***	[0.09]	257
Peru	1.83***	[0.41]	3.9	[2.37]	122	0.58**	[0.17]	1.81	[1.31]	122
Uruguay	0.12	[0.1]	0.24**	[0.12]	332	0.58	[0.44]	1.40***	[0.28]	332
Venezuela	0.73***	[0.07]	0.73**	[0.31]	253	1.44***	[0.18]	3.79**	[1.55]	253

(b)	Average (significant)	Countries	Average (significant)	Countries
Lower middle-income countries	1.27	7	1.10	6
Upper middle-income countries	0.84	7	1.95	5

Source: Authors' calculation, International Income Distribution Database.
Note: The table presents estimated coefficients of traded on informal non-traded job multipliers using equation (5) and International Income Distribution Database (I2D2). I2D2 is a World Bank project to collate, harmonize and make accessible comparable information from household surveys held b

y the World Bank, for poverty, inequality, education, demographics, and labor market analysis. For further details, see Montenegro and Maximilian (2009). Sectoral informal jobs are calculated using the number of employees that are not registered for social security system. Robust and clustered standard errors are shown in brackets. ***, **, and * indicate 1, 5, and 10% significance levels.

As the censuses in IPUMs do not tabulate an informality indicator, we employ World Bank's I2D2 database which allows classifying informality determined by whether the worker is registered to social security system.[15]

Table 4 presents the estimates for the T/NT_i and T/NT_f multipliers for 17 countries using I2D2 data. Strikingly, the informal multipliers are *always* positive, ranging from .24 to 1.9 (see Table A4) and again, decreasing in income (Table 3, column 8 at the 1% level).

[15] The correlation between the T/NT job multipliers of the overlapping countries in IPUMS and I2D2 is .57.

Specifically, they average 1.27 in lower middle-income countries and 0.84 in upper middle-income countries. This contrasts for the formal non-traded sector with an average higher T/NT_f multiplier of 1.1 in lower middle-income countries, and 1.95 in upper middle-income with no significant trend with income (Table 3, column 9).

The overall lower average T/NT_i values relative to average T/NT_f is noteworthy and suggests two possibilities. First, while the segmentation model of informality is not the dominant one, nonetheless it corresponds to a substantial segment of the sector and this pulls down the average multiplier. Second, the informal may have fewer linkages to formal enterprises than formal non-traded and hence this additional channel may be less influential.

The downward slope with income of the T/NT_i multiplier may have similar roots to that discussed for the general—a larger traded sector productivity relative to informal non-traded sector in lower income countries. Formal non-traded sector includes medical doctors and other professionals, while informal non-traded sector includes the masses of low-skilled service providers seen throughout the developing world. Another factor could be the composition of the non-traded sector which is more informal in lower income countries.

5. Discussions and Conclusion

This paper estimates job multipliers (Moretti, 2010), a critical parameter in location-based policy project appraisals, for a large set of developing and developed countries. We document much higher traded/non-traded multipliers for developing countries than the few existing estimates for advanced countries, and document a decline with income per capita. This suggests that policies to attract FDI or segments of value chains could potentially be more effective than previously thought in developing countries and less effective in some advanced countries where multipliers are negative. Consistent with theoretically predicted crowding out effects, the traded sector's job

multiplier on other traded sectors is found to be low or negative. We also find strongly *positive* traded/informal non-traded multipliers, paradoxically suggesting that increased modern employment may expand informality and that it cannot be considered purely a sector of disguised unemployment.

References

Bartik, T. J. (1991). "Who benefits from state and local economic development policies?" W.E. Upjohn Institute for Employment Research.

Bartik, T. J. (2020). "Using placed-based jobs policies to help distressed communities." *Journal of Economic Perspectives*, 34(3): 99–127.

Bartik, T. J., and N. Sotherland. (2019). "Local job multipliers in the United States: Variation with local characteristics and with high-tech shocks." Upjohn Institute Working Paper No. 19-301. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.

Blasio, G., and C. Menon. (2012). "Local effects of manufacturing employment growth in Italy." Mimeo, Bank of Italy.

Bosch, M., Goni-Pacchioni, E., and W. F. Maloney. (2012). "Trade liberalization, labor reforms and formal–informal employment dynamics." *Labour Economics*, 19(5): 653-667.

Carvalho, A., Lall, S. V. and C. D. Timmins. (2006). "Regional subsidies and industrial prospects of lagging regions." World Bank Policy Research Working Paper No. 3843.

Dieppe, A. (2020). *Global Productivity: Trends, Drivers, and Policies.* World Bank, Washington D.C.

Falco, P., Maloney, W. F., Rijkers, W., and M. Sarrias. (2015). "Heterogeneity in subjective wellbeing: An application to occupational allocation in Africa." *Journal of Economic Behavior and Organization,* 111: 137-153.

Fei, J. C. H., and G. Ranis. (1964). *Development of the labor surplus economy*. Homewood, IL: Richard D. Irwin.

Fiess, N. M., Fugazza, M., and W. F. Maloney. (2010). "Informal self-employment and macroeconomic fluctuations." *Journal of Development Economics*, *91*(2): 211-226.

Greenstone, M., and E. Moretti. (2003). "Bidding for industrial plants: Does winning a 'million dollar plant' increase welfare?" National Bureau of Economic Research, Working Paper No.9844.

Greenstone, M., Hornbeck, R., and E. Moretti. (2010). "Identifying agglomeration spillovers: Evidence from winners and losers of large plant openings." *Journal of Political Economy*, 118(3): 536-598.

Lewis, W. A. (1939). *Labour in West Indies: The Birth of a Worker's Movement*. Fabian Society, 1–41.

Lewis, W. A. (1984). "The state of development theory." *American Economic Review*, 74: 1–10.

Maloney, W. F. (2004). "Informality Revisited." *World Development*. World Bank, Washington, D.C.

Mazumdar, D. (1983). "Segmented labor markets in LDCs." *The American Economic Review*, *73*(2), 254-259.

Merotto, Dino; Michael Weber and Reyes Aterido. (2018). "Pathways to better jobs in IDA Countries: Findings from jobs diagnostics", Jobs Working Paper No. 14. Washington, D.C.: World Bank.

Minnesota Population Center. (2020). Integrated Public Use Microdata Series, International: Version 7.3. Minneapolis, MN: IPUMS, 2020. https://doi.org/10.18128/D020.V7.3

Mitol, J. A. (2001). "Boeing is wind under Chicago's Wings." http://more.abcnews.go.com/sections/business/dailynews/boeing010511.html

Moretti, E. (2010). "Local Multipliers." *American Economic Review*, Vol. 100: 1–7.

Moretti, E. (2011). "Local Labor Markets." in O. Ashenfelter and D.E. Card (eds.), *Handbook of Labor Economics*. Elsevier.

Moretti, E., and P. Thulin (2013). "Local multipliers and human capital in the United States and Sweden." *Industrial and Corporate Change*. Vol. 22 (1): 339-362.

Rodrik, D. "Premature deindustrialization." *Journal of Economic Growth*, 21(1): 1-33.

Trogen. P. (2002). Which economic development policies work: Determinants of state per capita income." Mimeo. East Tennessee State University: Johnson City. TN.

Van Neuss, L. (2019). "The drivers of structural change." *Journal of Economic Surveys*, Vol. 33(1): 309-349.

World Bank (2019). Jobs and Economic Transformation (JET) – Drivers, Policy Implications and World Bank Group Support. Washington, D.C., World Bank.

World Bank (2020). *World Development Report 2020: Trading for Development in the Age of Global Value Chains.* World Bank, Washington D.C.

World Bank (2021). *World Development Indicators.* World Bank, Washington D.C.

APPENDIX (NOT FOR PUBLICATION)

Table A1. Country-specific data coverage, IPUMS

Country	Data source	Time coverage
Argentina	National Institute of Statistics and Censuses	1970-1980-1991-2001
Austria	National Bureau of Statistics	1971-1981-1991-2001-2011
Benin	National Institute of Statistics and Economic Analysis	1979-1992-2002-2013
Bolivia	National Institute of Statistics	1976-1992-2001
Botswana	Central Statistics Office	1991-2001-2011
Brazil	Institute of Geography and Statistics	1960-1970-1980-1991-2000-2010
Cambodia	National Institute of Statistics	1998-2004-2008-2013
Canada	Statistics Canada	1981-1991-2001-2011
Chile	National Institute of Statistics	1982-1992-2002
China	National Bureau of Statistics	1982-1990-2000
Costa Rica	National Institute of Statistics and Censuses	1963-1973-1984-2000-2011
Dominican Republic	National Statistics Office	1960-1970-1981-2010
Ecuador	National Institute of Statistics and Censuses	1962-1982-1990-2001-2010
Egypt	Central Agency for Public Mobilization and Statistics	1986-1996-2006
Ethiopia	Central Statistical Agency	1986-1996-2006
Fiji	Bureau of Statistics	1976-1986-1996-2007
France	National Institute of Statistics and Economic Studies	1982-1990-1999-2006-2011
Greece	National Statistical Office	1981-1991-2001-2011
Guatemala	National Institute of Statistics	1964-1973-1981-1994-2002
Honduras	National Institute of Statistics	1961-1974-2001
Indonesia	Statistics Indonesia	1980-1985-1990-1995-2000-2005-2010
Ireland	Central Statistics Office	1971-1981-1991-2002-2011
Jamaica	Statistical Institute	1982-1991-2001
Kenya	National Bureau of Statistics	1960-1990-2000-2010-2015
Malaysia	Department of Statistics	1970-1980-1991-2000
Mali	National Directorate of Statistics and Informatics	1987-1998-2009
Mexico	National Institute of Statistics, Geography, and Informatics	1990-2000-2010
Morocco	High Commission of Planning	1982-1994-2004
Nicaragua	National Institute of Statistics and Censuses	1971-1995-2005
Panama	Census and Statistics Directorate	1960-1970-1980-1990-2000-2010
Paraguay	General Directorate of Statistics, Surveys, and Censuses	1962-1972-1982-1992-2002
Portugal	National Institute of Statistics	1981-1991-2001-2011
Puerto Rico	U.S. Bureau of the Census	1990-2000-2005-2010
Romania	National Institute of Statistics	1992-2001-2011
Spain	National Institute of Statistics	1981-1991-2001-2011
Thailand	National Statistical Office	1970-1980-1990-2000
Trinidad and Tobago	Central Statistical Office	1980-1990-2000
Turkey	Turkish Statistical Institute	1985-1990-2000
Venezuela	National Institute of Statistics	1981-1990-2001
Vietnam	General Statistics Office	1989-1999-2009
Zambia	Central Statistical Office	1990-2000-2010

Note: All datasets are nationally representative census microdata samples, provided by national authorities. Accessed through Minnesota Population Center. Integrated Public Use Microdata Series (IPUMS), Version 7.2. Dataset downloaded from https://ipums.org/projects/ipums-international/d020.v7.2.

Table A2. Country-specific data coverage, I2D2

Country	Data source	Time coverage
Argentina	Socio-Economic Database for Latin America and the Caribbean	2006-2010-2014
Bolivia	Socio-Economic Database for Latin America and the Caribbean	1999-2005-2011-2015
Brazil	Socio-Economic Database for Latin America and the Caribbean	1997-2003-2009-2015
Chile	Socio-Economic Database for Latin America and the Caribbean	1987-1994-2000-2006-2011-2017
Colombia	Socio-Economic Database for Latin America and the Caribbean	2002-2007-2013-2017
Costa Rica	Socio-Economic Database for Latin America and the Caribbean	2001-2005-2010
Dominican Rep.	Socio-Economic Database for Latin America and the Caribbean	2000-2007-2015
Ecuador	Socio-Economic Database for Latin America and the Caribbean	2003-2006-2009-2012
El Salvador	Socio-Economic Database for Latin America and the Caribbean	2004-2009-2014
Guatemala	Socio-Economic Database for Latin America and the Caribbean	2002-2006-2014
Honduras	Socio-Economic Database for Latin America and the Caribbean	2001-2005-2010-2016
Mexico	Socio-Economic Database for Latin America and the Caribbean	1994-2000-2006-2012
Nicaragua	Socio-Economic Database for Latin America and the Caribbean	1998-2005-2009
Paraguay	Socio-Economic Database for Latin America and the Caribbean	2002-2007-2013-2017
Peru	Socio-Economic Database for Latin America and the Caribbean	2000-2005-2010-2015
Uruguay	Socio-Economic Database for Latin America and the Caribbean	2000-2005-2010-2015
Venezuela	Socio-Economic Database for Latin America and the Caribbean	1995-2000-2005

Note: Socio-Economic Database for Latin America and the Caribbean includes statistics on social and economic variables based on microdata from household surveys. Accessed through World Bank. Latin America and the Caribbean, International Income Distribution Database (I2D2), 1970-2017. Dataset downloaded from https://datacatalog.worldbank.org/dataset/international-income-distribution-database-1970-2017.

Table A3. Correlation matrix of variables used in Table 3.

	Per capita income	T/NT relative productivity	Agricultural employment	NT value-added share
Per capita income	1			
T/NT relative productivity	-0.07	1		
Agricultural employment	-0.86	-0.17	1	
NT value-added share	0.86	-0.22	-0.76	1

Note: See Section 3 for variable definitions.

Table A4. Job multipliers, I2D2, traded on non-traded

Country	OLS		IV		N
Argentina	1.46***	[0.06]	2.96***	[0.11]	64
Bolivia	3.61***	[0.3]	4.53***	[0.66]	18
Brazil	0.82**	[0.32]	4.72***	[0.48]	54
Chile	1.88***	[0.02]	1.65***	[0.01]	26
Colombia	2.70**	[1.01]	4.61***	[0.72]	48
Costa Rica	0.24	[0.84]	-1.94	[3.32]	14
Dominican Rep.	1.44***	[0.26]	100.11	[2929.83]	60
Ecuador	3.90***	[0.9]	4.64***	[1.27]	44
El Salvador	1.80***	[0.15]	2.51***	[0.13]	28
Guatemala	1.21***	[0.07]	1.57***	[0.04]	43
Honduras	0.88**	[0.32]	0.89**	[0.43]	32
Mexico	2.24***	[0.52]	3.57***	[0.68]	64
Nicaragua	1.42***	[0.05]	1.45***	[0.03]	31
Paraguay	1.31***	[0.07]	1.54***	[0.24]	33
Peru	2.52***	[0.24]	1.58***	[0.24]	14
Uruguay	3.22***	[0.04]	3.21***	[0.05]	38
Venezuela	1.64***	[0.19]	1.58***	[0.16]	44

Source: Authors' calculation, International Income Distribution Database.
Note: The table presents estimated coefficients of traded on non-traded job multipliers using equation (1) and International Income Distribution Database (I2D2). I2D2 is a World Bank project to collate, harmonize and make accessible comparable information from household surveys held by the World Bank, for poverty, inequality, education, demographics, and labor market analysis. For further details, see Montenegro and Maximilian (2009). Robust and clustered standard errors are shown in brackets. ***, **, and * indicate 1, 5, and 10% significance levels.