THE ECONOMICS OF INTERNATIONAL MIGRATIONS

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Summary

The key question for the economics of international migration is whether observed real wage differentials across countries represent an economic inefficiency sustained by legal barriers to labor mobility between geographies. A simple comparison of the real wages of similar workers across countries shows massive gaps between rich and poorer countries. These gaps persist after controlling for observed and unobserved human capital characteristics, suggesting a "place premium" -- or space-specific wage gaps that are not due to intrinsic worker productivity but rather are due to a misallocation of labor (Clemens, Montenegro, & Pritchett, 2019). The idea of a place premium is corroborated by macroeconomic evidence. National accounts data show large cross-country output per worker differences, driven by the divergence of total factor productivity. These spatial productivity differentials create differences in the marginal product of factors, which can equalize with factor flows, but appear to persist and are massive, in the case of labor suggesting legal barriers to labor migration are in fact constraining significant return on human capital. A relaxation of these barriers would generate worker welfare gains that dwarf gold-standard poverty reduction programs.

JEL Codes: F22, J61, J71, O11

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Section 1: Introduction

Perhaps the single most obvious and striking fact about the global economy is the cross-national difference in wages. The key question for the economics of international migration is to what extent these observed differences in wages represent potential gains from the movement of labor. Are there really "trillion dollar" bills on the sidewalk (Clemens, 2011)? Differences in average wages may not reflect any incentives for migration/mobility if lower wages are due to lower intrinsic productivity ("human capital") of workers. However, five independent strands of evidence suggest massive consumption wage differences across countries for workers of identical intrinsic individual productivity due to a "place premium" in high productivity places and hence large pressures for international labor mobility which are prevented by border-based barriers to labor mobility in high wage countries.

First, the consumption wages in Purchasing Power Parity (PPP)[1] of workers with the same level of formal schooling, e.g. secondary schooling complete, differ by a factor of 10 between the average for low wage (bottom 30 percent) and high wage (OECD) countries. There are even larger gaps across individual countries: wages of workers with secondary school in Netherlands are 25 times higher than those in Ethiopia. Even adjusting schooling for differences in learning leaves massive wage gaps between equal "schooling capital" workers across countries (section 2.1). Second, wages of workers in the same narrow, low to medium skill, occupations, like waiters or truck drivers or construction workers, differ by a factor of 5 to 10 between low wage countries (bottom 30 percent) and the OECD (Section 2.2). Third, even adjusting econometrically for both observable and unobservable worker characteristics, the ratio of wages in the USA to wages in their home country of "adjusted to equal individual

[1] Unless otherwise specified all comparisons in this paper of wages across countries are deflated by PPP and hence reflect consumption, not product wages.

productivity" low/medium skill workers from 42 countries ranges from a low of 2 to over 10 (Section 3.1). Particularly for low to medium skill workers (not perhaps mobility of "global superstars") most studies show adjusting for selectivity produces a modest sized adjustment in moving from wage differences of "observational equivalent" to "equal productivity" workers (McKenzie, Stillman, and Gibson (2010); Collins and Wanamaker (2014); Bertoli, Fernández-Huertas Moraga, and Ortega (2011); Ambrosini and Peri (2012)). Triangulation from numerous methods suggests selectivity accounts for between 0 percent and 2 percent of the observed earnings difference between immigrants and their observed "counterfactual" at home. This implies accounting for migrant selection would, at most, reduce an "observational equivalent" adjusted wage ratio of 5 to 1 to 4 to 1 for "equal productivity" workers (Section 3.2). Fourth, both survey data and behavior reveal massive excess demand for mobility, consistent with much higher available incomes for movers (Section 4). Importantly, these four sources of microeconomic evidence about wage gaps are consistent with the fifth element: national accounts data also show large cross-national differences in wages, adjusted for schooling capital (Section 5).

This paper suggests there is a relatively straightforward reconciliation of the existing economy-wide models of aggregate income/growth and the micro-economic evidence about observed wage differentials and labor mobility. Across countries there are both (a) long-term persistence in aggregate productivity levels with, at best, weak pressures for absolute cross-national convergence and (b) spatial shocks to labor productivity over time (e.g. changes in world demand for resources). These create spatial differences in the marginal product of factors, even across exactly equal intrinsic productivity workers and hence, without mobility, persistent large differences in the wages of workers with exactly the same intrinsic productivity. Legally

enforced barriers to the mobility of labor enforced by rich countries prevent these large differences in productivity from creating labor flows. If something like this is correct then there are "trillion dollar bills" due to this enforced economic inefficiency and, at the margin, the relaxation of the binding constraints on labor mobility are the highest return to human well-being actions available in the world—with gains orders of magnitude larger than other types of policy reform or "anti-poverty" projects that attempt to raise productivity *in situ* (Pritchett, 2018) (Section 6).

This review of the *economics* of migration pays relatively little attention to the voluminous literature on the impact on wages of receiving countries as (i) there are recent massive reviews of this literature (National Academies of Sciences, 2017), (ii) this literature shows convincingly that the gains to average wages of native-born workers in the USA (the most widely studied country) are small and positive and the only uncertainty is about wage impacts among small populations of workers (National Academies of Sciences, 2017), (iii) there are good reasons to believe restrictions in rich countries are mainly political, particularly about control of the ethnic composition of the population, and are not primarily based on narrow economic criteria, (iv) general equilibrium estimates of modest sized incremental movements of labor from poor to rich countries show that the gains/losses for non-movers in receiving countries are orders of magnitude smaller than the gains to movers (e.g. Walmsley and Winters (2002)).

Section 2: International wage differences by schooling and skill

Comparing the raw distribution of wages across countries is largely irrelevant to international migration as the structure of the labor force and the distribution of human capital is widely different. That the daily wages paid to a person with no schooling to transplant rice in rural Vietnam and the daily wage of a professor of economics in Geneva Switzerland are widely

different is obvious, and, at the same time, not relevant to questions of labor mobility. This section presents data from two independent sources showing the differences across wages of individuals with the same levels of formal schooling and in the same occupations. Since GDP is value added and labor is a major source of value added it is (very near) an accounting identity that earnings per worker are higher in high GDP per capita than low GDP per capita countries. But it is possible that these differences are all, or mostly, compositional and that workers with the same "human capital" have the same earnings and average differences across countries are (proximally) accounted for by differences in "human capital." While the analysis gets more sophisticated, it is worth starting by documenting the magnitude of the gaps in wages of workers across countries with the same levels of schooling or in the same occupations. This provides a set of facts that both micro-economic theories and macro-economic theories have to be capable of encompassing.

2.1: Wages by level of schooling

The World Bank has collected the raw data from a large number of labor force surveys from around the world that provide broadly comparable data on earnings and level of formal schooling and some data on occupation, sector, and location. These data have been used to estimate Mincer-like regressions of wages on schooling (and other characteristics) for a large number of countries (Montenegro and Patrinos (2014), King, Montenegro, and Orazem (2012)). The empirical results show incremental wage gains of around 10 percent per year of schooling, with only a modest degree of variability around that average.

As the raw data are not publicly available, the following analysis uses the median wages by level of schooling for those countries for which this is available, which was provided directly to the authors in local currencies, converted into PPP units in 2011 using the exchange rates in

Penn World Tables 9.1 (Feenstra, Inklaar, & Timmer, 2015). Two points. One, this is a consumption wage that is potentially relevant for labor migration and potential gains to migrants, not a product wage or unit labor cost, that would be more relevant to, say, investment location decisions. Two, this adjustment in PPP assumes that *all* of consumption from wages is in the country in which the labor income is earned. This can substantially *understate* the gains from labor migration from a poor country to a rich country if (i) wages in rich receiving countries generate remittances spent in the sending country, and the World Bank estimates total magnitude of remittances to developing countries was $529 billion in 2018[2], or (ii) migrants had high savings and returned to consume in the sending country. Since prices in sending countries are, on average, substantially lower than in the receiving country, would-be migrant wages adjusted for the location of consumption could be higher than the PPP wage differences by a factor of 2 or more (so a factor of 5 difference in cross-national fully adjusted PPP wages could be a factor of 10 in consumption-location-adjusted wages).

Figure 1 shows the wages by level of schooling between the high-income countries and those countries with GDP per capita less than P$15,000. Figure 2 shows wages by level of schooling for three selected countries: the Netherlands (high wage), Dominican Republic (medium wage) and Ethiopia (low wage). These figures illustrate three key facts.

First, the wage gaps or ratios of wages for workers with the same level of schooling are massive at each level of schooling. For workers with secondary schooling, the gap is around P$14,813 between the rich industrial world and the low-income countries. The ratio of wages is 10 to 1. Between workers in the Netherlands and workers in Ethiopia the gap is P$23,000, a ratio of 22 to 1.

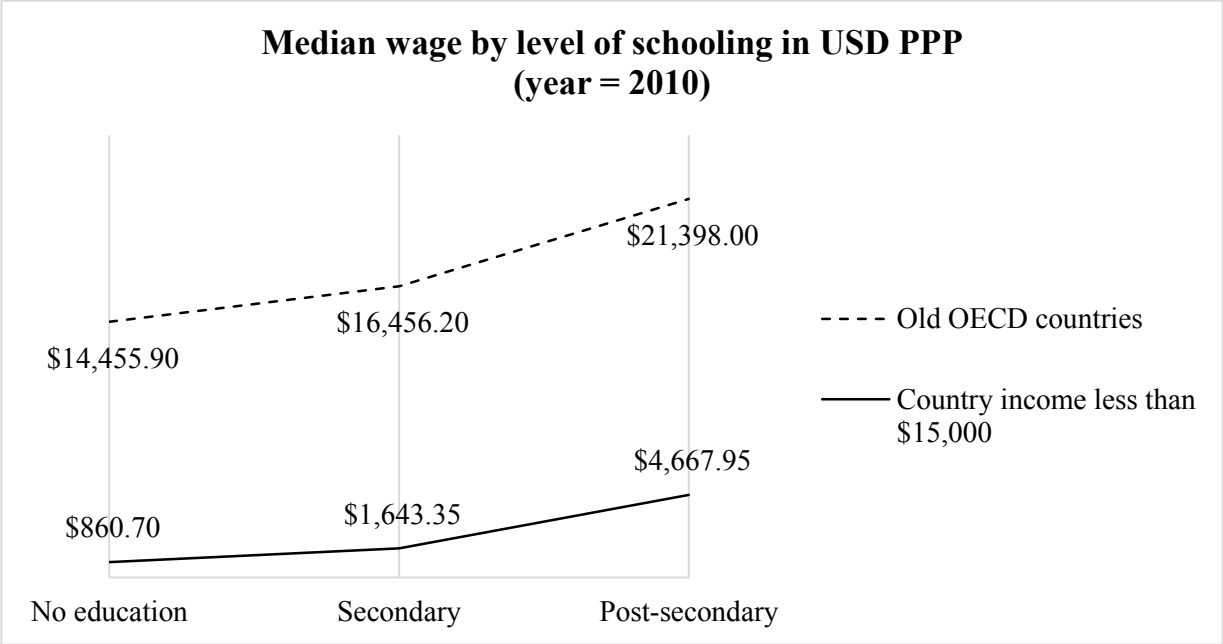
[2] (*The World Bank: Remittances Data*)

Second, the wage gap in absolute terms is larger at higher levels of schooling, even when the ratio is smaller. A basic Mincer regression assumes the *natural log* of wages of the i^{th} worker in the j^{th} country is linear in the level of schooling (equation 1):

$$1)\ \ln\left(w^{i,j}\right) = \alpha^{j} + r^{j} * S^{i,j}$$

If high- and low-income countries had same Mincer wage increment ($r^{High}=r^{Low}$) then the ratio of wages would stay constant and the absolute gap increase. Even if the wage increment in the rich country were much lower ($r^{High}<<r^{Low}$), consistent with a lower return to schooling where the level of schooling is higher (Bils & Klenow, 2000), (Pritchett, 2006), the ratio of wages could fall but the absolute gap still increase. Figure 1 shows that wages increase *proportionately* much more by level of schooling in the rich countries (wages are higher by 30 percent in the OECD for those with post-secondary schooling, but a factor of 2.8 in the poorer countries) but the *absolute* gap grows to P$16,371 for workers with post-secondary schooling.

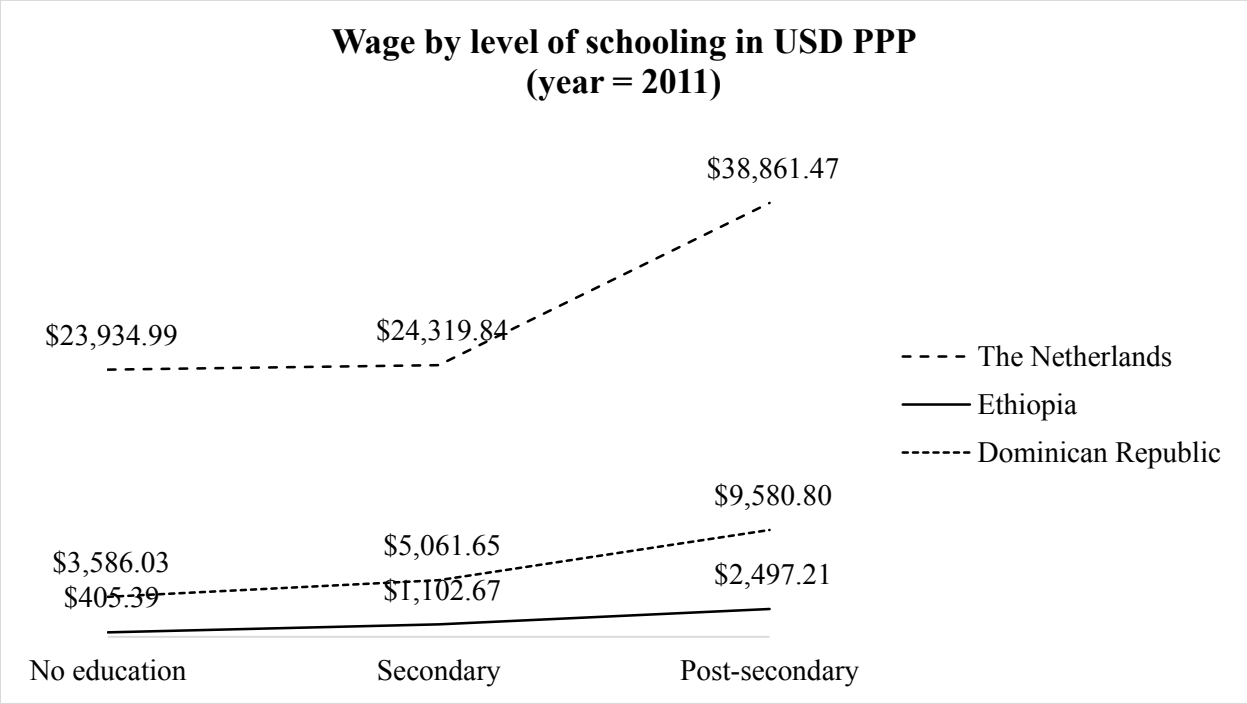
Figure 1: The annual earnings (in PPP$) of workers with secondary schooling is P$16,456 in the rich industrial countries and 10 times lower (P$1,643) in low income (GDP per capita below P$15,000) countries.



Source: Author's calculations with data provided by Claudio Montenegro from World Bank labor force survey data.

Note: Old (prior to new members) OECD countries include *Australia, Austria, Belgium, Denmark, Finland, France, Germany, Luxembourg, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom, United States.* As a number of these countries lacked data for "no schooling" it was predicted from their level of wages of those with secondary schooling. Countries at less than P$15,000 are *Bangladesh, Bulgaria, Colombia, Dominican Republic, Ecuador, Ethiopia, Gambia, Honduras, India, Indonesia, Jordan, Mexico, Mongolia, Nepal, Nigeria, Pakistan, Paraguay, Peru, Philippines, Rwanda, South Africa, Uganda, Vietnam, Zambia*

Figure 2: Wages by level of schooling in three countries: Netherlands, Dominican Republic, and Ethiopia



Source: Author's calculations with data provided by Claudio Montenegro from World Bank labor force survey data.

The third point that emerges from these graphs is that the "place" effect (α^j in the Mincer equation) dominates the individual schooling effects ($\beta^j * S^{i,j}$) in determining wages. It is much more where you are (place) than who you are (personal characteristics) that determine wages[3]. The wages of workers with no schooling at all in the rich countries are much, much higher than those of workers with post-secondary schooling in the low-income countries. In calculations of the wage gain from migration, adjusting wages in a rich receiving country for the human capital acquired from schooling in a poorer sending country is almost certainly second order (especially for the poorest countries). That is, all standard cross-national assessments of learning (e.g. PISA, TIMSS, DHS) reveal that a year of schooling conveys very different amounts of academic

[3] Milanovic (2013) uses income/consumption (not wage) data to show that more than two thirds of total household/individual global inequality in 2000 is due to differences across countries, and only a third to the differences in the income distribution within countries.

capabilities—like reading (Pritchett & Sandefur, 2017) and mathematics skills--across countries, and this documented more recently and comprehensively in the World Bank's learning measures for their Human Capital Index (Angrist, Djankov, Goldberg, & Patrinos, 2019). Moreover, it is plausible that even beyond general measures of academic capabilities schooling can provide attributes (norms, dispositions, beliefs) that have country specific labor market benefits that are not portable—the most obvious example being learning one's native tongue versus the language of a potential destination country.

However, between countries like Ethiopia and Netherlands the gaps between the place ($\alpha^{Ethiopia} << \alpha^{Netherlands}$), proxied as the wage of individuals with no schooling (though obviously there are few such people in the Netherlands and many in Ethiopia), are very large compared to the increment to ln(w) from a year of schooling in the Netherlands, which, crudely, if everything were linear (which it isn't) is a modest per year of schooling gain: (ln(38861)-ln(23945)/16)=.485/16=.0303. Suppose that the wage increment to the wages from a year of schooling in Ethiopia in the labor market in the Netherlands is some fraction of the gain to a year of schooling in the Netherlands in the labor market in the Netherlands. Imagine a worker with post-secondary schooling (assume ~16 years of schooling) gets a predicted wage of:

$$2)\ \ln\left(w^{Ethopian\ in\ Netherlands}\right) = \alpha^{Netherlands} + (1 - Melt^{Eth,Nld}) * r^{Nld} * S^{Ethiopia}$$

Where "melt" is the fraction of a year of schooling received in Ethiopia producing wage gains in the Netherlands compared to a year of schooling in the Netherlands. If "melt" is 1 then an Ethiopian with post-secondary schooling just makes the same in the Netherlands as someone with no schooling, Ethiopian schooling has zero return in the Netherlands. If "melt" is 0 then an Ethiopian would make the same as someone who got their schooling in the Netherlands. As Table 1 shows, since the earnings of someone even with a post-secondary schooling in Ethiopia

are so low, the absolute magnitude of the gap is very high even if "melt" is complete. Table 1 also shows this same calculation between "rich" and "poor" countries on average and it is still the case that even complete "melt"—so that even if schooling in a source country counts for nothing in a receiving country the wage gaps for post-secondary workers in poor countries and workers with no schooling in rich countries are P$14,456

Table 1: Even if the wage gains from schooling are not portable to a different country the wage gaps are considerable

Degree of "melt" of returns to schooling		Difference in wages of post-secondary worker	
		Ethiopia to Netherlands	Low income to high income
Schooling in source has same impact on wages in receiving country as schooling in that country	0	$ 38,891	$ 21,398
	0.25	$ 34,447	$ 19,400
	0.5	$ 30,510	$ 17,588
	0.75	$ 27,023	$ 15,945
Schooling in source has no impact on wages in receiving country	1	$ 23,935	$ 14,456

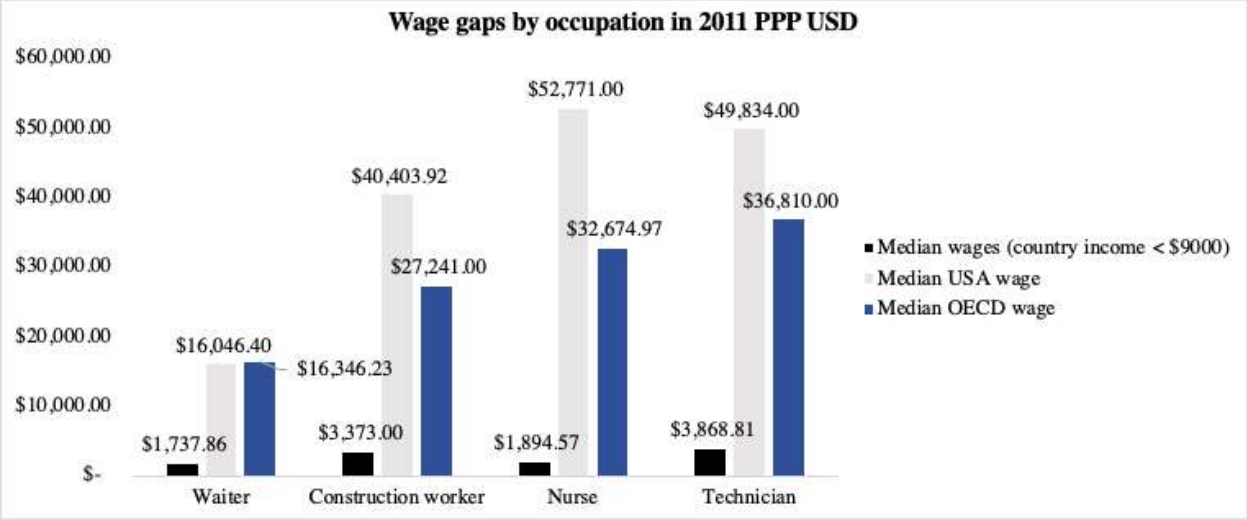
Source: Author's calculations with wage data from World Bank labor market survey data.

2.2: Occupational wage gaps

The ILO Occupational Wages around the World data (Oostendorp, 2012) provides wages of workers in the same occupation but different countries in local currency, again converted with PPP exchange rates to produce consumption wages. This data is sparse, as different countries have reported wages for different occupations so the composition of the categories "OECD" and "low income" differ from category to category. Figure 3 shows the annualized wages for waiters, construction workers, nurses and technicians. These data on wages by occupation,

which are a completely different source as the data above, reproduce the same three key points as above.

Figure 3: There are massive wage gaps across workers in the same occupations between low income and OECD countries, at occupations at all skill levels



Source: Own calculation using data from PWT9.0 and ILO Occupational Wages around the World data

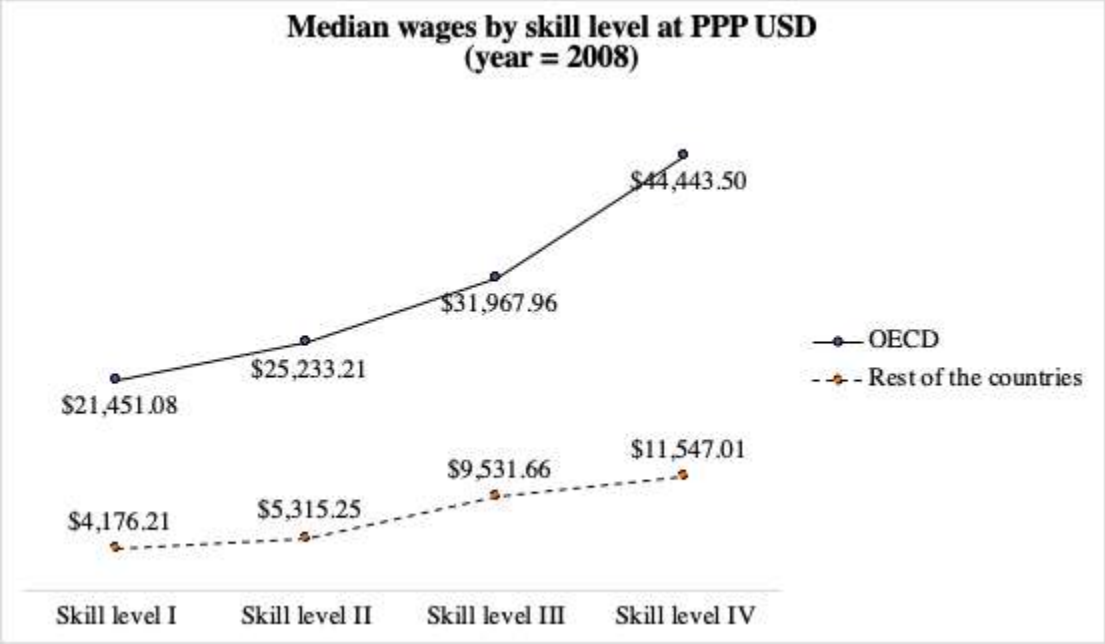
Note: USA annual average wage includes wages in years matching countries in sample

*Technician includes chemistry technician, petroleum and gas extraction technician, medical x-ray technician, electronics engineering technician

First, the wage gaps are massive for each occupation, even for a low-skill occupation like "waiter" where the actual work performed is nearly identical. It is striking (given that the data are completely different sources and the composition of countries in the "high" and "low" income are different) that the data for "waiters" reproduces the wages and wage gaps for 'secondary educated" almost exactly, P$1,737 in low income countries (versus P$1,643) and P$16,346 in OECD (versus P$16,456) for a wage gap of P$14,609 (versus P$14,813). Ashenfelter (2012, Table 3) takes this comparison further, comparing product wages for workers in the same company (McDonalds), doing exactly the same work and shows "Big Macs per hour of work" is 6.9 times higher in the USA than in India or Latin America, 6.2 times higher than in the Middle East, and 3 times higher than in South Africa.

Second, the absolute wage gaps increase with skill level. Oostendorp (2005) estimates the skill level of each occupation, categorized from skill level I to IV. Even though the gains to skill are larger proportionately in poorer countries (as one might expect in countries with low average skill levels) the absolute gap increases.

Figure 4: The wage gap increases in absolute terms with the skill level of occupations



Source: Author's calculations with (Oostendorp, 2012) OWW data.

Third, again the "place" effect dominates the "skill" effect and a worker in the lowest skill occupations (Level I) in a rich country makes almost twice as much as a worker in the highest skill category (Level IV) in a poor country (P$21,451 versus P$11,547).

Section 3: Wage gaps in "observed equivalent" and "equal productivity" labor

This section moves from observational facts to estimate the local average treatment effect (LATE) of place on wages - or the wage premium from working in a specific place. Chiang (2019) science fiction story *Anxiety is the Dizziness of Freedom* takes economist's concern with causal identification of treatment effects to the next level. Going beyond even a twin's thought

experiment, he takes Hugh Everett's "many-worlds" interpretation of quantum mechanics literally and imagines a machine allows a person to track their alternative lives that result from quantum events. Imagine two identical selves split by a quantum event into parallel realities and that one self is instantaneously transplanted into a different labor market (say, from Ethiopia to the Netherlands). What would be the Local Average Treatment Effect (LATE)—evaluated over various time horizons (e.g. one month, six months, three years, etc.) of the "treatment" of movement across place of exactly the same individual? There is a reason it is science *fiction;* we cannot observe the factual and counter-factual for the same person. Moreover, people are not (typically) "exogenously" anywhere, people are where they are for reasons (this is true of movement within countries and across borders). Recovering the LATE of place, the wage difference of equal productivity workers, is going to be a challenge.

The first sub-section reports the results of using observational data and econometric techniques to estimate lower bounds on effects with selection on observables to estimate a lower bound on the wage differences across places (each of 42 countries versus the USA) of equal productivity workers. The second discusses the literature that uses methods of identification, such as random selection from a pool of eligible or regression discontinuity, to estimate the LATE of place. Both conclude that, while the wage gaps in section 2 tend to overstate the LATE of place due to positive selectivity of migrants on unobservable characteristics, the wage gaps of equal productivity workers across different places (labor markets) are massive.

3.1: Wage gap of observationally equivalent workers to lower bound on equal productivity

Clemens, Montenegro, and Pritchett (2019) combine the World Bank's collection of labor market surveys and the US Census data to estimate the LATE of place or "place premium." One can distinguish two conceptual steps: (1) estimating the wages of observationally

equivalent workers in two different places (their home country and the USA) for 42 different countries and (2) using the Altonji (2005)/ Oster (2015) methods to adjust for the potential selectivity on *unobserved* variables that affect productivity, hence adjusting the "observational equivalent" wage gap to a *lower bound* on the "equal productivity" wage gap.

The first conceptual step is the estimation of two wage surfaces. With Nigeria as an example, CMP use the Nigerian labor force survey data to estimate the wage surface of workers in Nigeria with respect to observed characteristics (e.g. age, sex, residence, sector, and schooling) associated with wages. They then use the US Census data people born and educated[4] in Nigeria but working in the US to estimate a wage surface for Nigerians working in the USA. CMP estimate the USA versus sending country "place premium" for observationally-equivalent workers as the difference between the predicted wages (point on the respective wage surfaces) of two workers sharing the same "observables" but one working in Nigeria and one working the USA. The "place premium" is specific to the "reference" worker characteristics and is a Nigerian-born, Nigerian-educated, 35-year-old, urban resident, male, with 9-12 years of schooling, working in the formal sector. The estimated wage USA/Nigeria wage ratio for this reference category worker is 16.3.

CMP estimate this wage ratio for 42 different countries (all of those with both labor market data to estimate the "home country" wage surface and sufficient observations in the US

[4] Since the US includes data on the timing of one's arrival in the USA separate coefficients for schooling in the USA versus schooling in Nigeria can be produced, so the quality of schooling in Nigeria for producing wage gains in the USA (including both academic quality and labor market specific factors—the "melt" of human capital) is already taken into account.

Census to estimate the US wage surface for people born in that country). For India, Indonesia, Bangladesh and Pakistan this wage ratio stands at 7.8, 7, 5.5 and 7.4 respectively[5].

This is a big advance on section 2.1 which compares all workers in Nigeria to all workers in the USA with secondary schooling by both only comparing nationals in two labor markets and more controls. However, the interpretation of the wage gaps of "observed equivalent, reference category" workers as the LATE of place for a typical or marginal mover, even with the same characteristics, is limited as there is no correction for selectivity on unobserved characteristics that affect productivity/wages in the sending and receiving markets.

Before reporting the CMP results using the Altonji/ Oster econometric techniques developed to adjust for selectivity, it is worth honing one's intuition for how large these adjustments might be expected to be. One, the reference category workers in CMP are making on average $10 an hour in the USA—the low end of the wage distribution for natives--and are working in mainly low skill occupation, these are not global super-stars. If one were trying to estimate the wages of Argentine born professional soccer players who are playing in Argentina versus playing in Spain based on height and measured 40 yard dash speed, one would expect both a fantastically long-tail of earnings based on realized performance, only weakly related to observables (that is, Lionel Messi) and hence the place premium might appear fantastically large and be entirely selection. Second, given (i) the massive differences in predicted wages (a factor of say, 10 to 1) and (ii) the modest variance of the distribution of the regression residual (which is the distribution of wages, reduced by the component explained by observed characteristics) there is almost no common support of the distributions of predicted wages for the reference

[5] All of these wage ratios are estimated in PPP. As noted above, this can substantially *understate* the gains to moving if some significant fraction of earnings is spent in the home country (e.g. remittances, savings) where prices are (much) cheaper.

category worker between home and USA share almost no common support. That is, the predicted wages in Nigeria are around P$1,200/month and in the USA are P$18,000, even in those working in the USA would have otherwise had been at three times the predicted wage due to observables correlated with migration propensity, this is still just P$3,600 a month. Three, there is not actually that much either on the choice of the mover or in the process used by the USA for legal migration possibilities for low-medium skill workers that suggests the process is driven by selection on unobserved productivity—unlike "talent" visas or those for education or H1-B--and can imagine that a fair amount of why some people are in Nigeria and others are in the USA has to do with having a relative in the USA not one's counter-factual wage being high in Nigeria. Fourth, selectivity might be very different for different countries, particularly say, countries close to/sharing a border with the USA (e.g. Mexico, Central America, Caribbean) versus countries far from the USA. For this we have the advantage of 42 countries, so we are not estimating only one type or mode of selectivity.

Altonji et al. (2005) proposed a method for adjusting estimates for selectivity on unobserved variables, which has been honed by Oster (2015). The basic intuition is to estimate a bound on LATE-like estimates by assuming that selectivity on all unobservable characteristics is the same magnitude as selectivity on the observed characteristics and adjusting coefficients for this bias. Table 2 presents the CMP results for the Oster (2015) adjusted estimates of the differences in wages of the reference category, which is a lower bound of the estimate for "equal productivity" workers (adjusting for both observed and unobserved productivity) or the LATE of place because the selectivity on unobservable characteristics may well be non-existing or weaker than on observables. The population weighted average gain for the reference category worker (9-12 years of schooling, urban, male, 35-year-old, formal sector) across the ten largest

developing countries is P$17,816 and population weighted average across all 42 countries is P$17,115. The unweighted median wage gap is P$15,512 (lower than the population weighted average since India is very big and has a high estimated place premium).

Table 2: Estimates of the (selectivity adjusted) wage gains for low/medium skill workers from the 10 largest countries to the USA show a gain of P$15,981 per year

Country	**Percent difference in predicted wages USA versus home for reference category worker**	**Ratio**	**Annual predicted wages of reference category low/medium skill worker in the US, $/hour in 2000**	**Upper bound estimate (adjusted for migration selectivity) of the annual wage in home country for reference category worker, $/hour (adjusted for PPP)**	**Lower bound on LATE of Place (Gain from labor mobility for a reference category worker)**	**Population aged 15-49, in millions (sorted on this column)**
India	493.0%	5.9	$23,846	$4,021	$19,825	545
Indonesia	519.1%	6.2	$21,194	$3,423	$17,771	117
Brazil	240.0%	3.4	$23,818	$7,005	$16,813	97
Bangladesh	407.7%	5.1	$19,315	$3,804	$15,510	67
Pakistan	484.7%	5.8	$21,662	$3,705	$17,957	65
Nigeria	1476.4%	15.8	$18,689	$1,186	$17,503	57
Mexico	155.7%	2.6	$17,511	$6,849	$10,662	54
Vietnam	655.4%	7.6	$19,820	$2,624	$17,196	44
Philippines	247.5%	3.5	$18,133	$5,218	$12,915	40
Thailand	139.6%	2.4	$18,205	$7,598	$10,607	36
Egypt	1111.6%	12.1	$20,739	$1,712	$19,028	34
11 largest population countries average (total population)	423.6%	5.2	$22,022	$4,206	**$17,816**	1,156
Population weighted average, 40 countries (total)	361.1%	4.6	$21,855	$4,740	**$17,115**	1,435
Assuming 2080 hours, per hour			$10.51	$2.28	$8.23	

Source: Adapted from Clemens, Montenegro, Pritchett (2019), Table 3

3.2: Selection bias and the LATE of place

Migrants self-select into a work location based on a mix of observed and unobserved traits and as such, the observed wage gaps between observationally-equivalent workers in destination and sending countries are likely to be biased (upward or downward) by the extent that migrants self-select based on unobserved traits which impact their earnings in destination countries (Clemens, 2019). Isolating the portion of the wage gaps between destination and sending countries that are due to place-specific productivity differentials (LATE of a place) requires predicting the degree of migrant selection on unobservable characteristics.

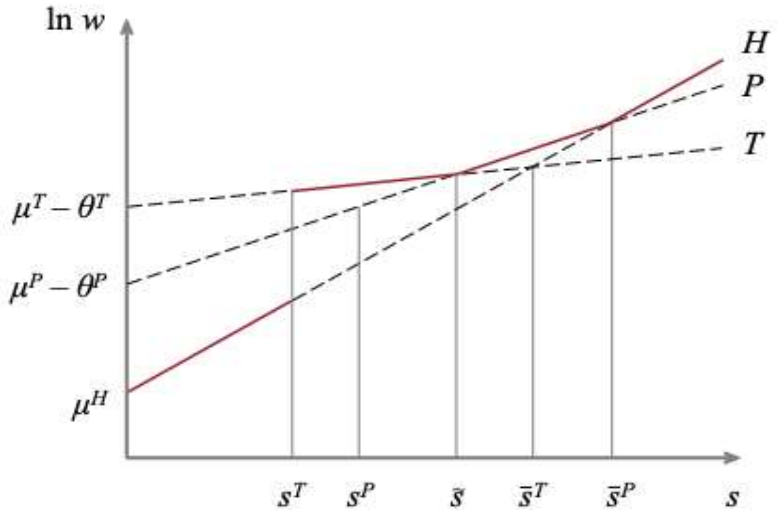
Clemens (2019) provides a causal estimate of the impact on households from Indian workers performing *temporary* work in the United Arab Emirates (UAE) and in doing so, an estimate of the direction and magnitude of selection. In 2008, the observed mean wage ratio of an Indian man, between 30-34 years old with some secondary schooling, working in the UAE and a similar man working in urban India was 4.86 (rural India 7.91). Clemens builds on the standard self-selection model (Roy (1951), Borjas (1991), Chiquiar and Hanson (2005) and Hanson (2006)) to predict selection on observable traits (such as schooling or skills). Under the standard self-selection model, migrants choose between their work location (temporary (T) destination country, permanent (P) destination country, home (H)) by maximizing their real wage, subject to migration costs (equation 3): the natural log of real wage (w) in a given location j is determined by the place premium (μ^j, the pure country nominal wage for unskilled worker adjusted by the price levels to give real wage) and the return (δ) on observable skills such as schooling (s). Migration cost θ^j is a function of wage units and is zero if the worker decides to remain at home ($\theta^H = 0$).

$$3)\ ln\, w^j - \theta^j = \left(\mu^j + \delta^j s\right) - \theta^j \qquad j \in [H, T, P]$$

The country effect is the highest for temporary migrants then permanent. This is because temporary migrants earn high wages abroad but spend the majority of foreign income at home (at lower prices),

compared permanent migrants who spends their wage in the destination country at high prices. At the same time, the return on observed skills is the lowest for temporary migrants - compared to permanent migrants, who enjoy a long time horizon to adapt their skills to the destination country, and to home-stayers who enjoy higher returns on skills utilized in the home market where skills are scarce. Figure 5 below illustrates the real wage function in three locations (temporary destination, permanent destination, home) and the predicted selection patterns. Workers at each skill level will choose to maximize their real wage. This implies intermediate self-selection on observables -- migrants who self-select into temporary migrations are at the middle skill range. This model for selection on observed traits can be extended to a model of selection on unobserved traits. However, predictions of positive, negative, or intermediate self-selection is unknown and depends on parameters affecting and affected by unobserved traits.

Figure 5: The standard migrant self-selection model predicts migrants at the middle skill range to select temporary migration, compared to low skilled workers who choose to stay at home or high skilled workers who choose permanent migration



Source: Clemens (2019)

Clemens extends this model to allow the prediction of positive or negative selection bias, by comparing the differences in unconditional (absolute) wage gaps between migrant workers and workers who chose to stay and the wage gaps of observationally-equivalent workers and uses this model to

empirically test for negative or positive selection bias among Indian workers who performed guest construction work in the UAE using a natural experiment. In late 2008/ early 2009 thousands of Indian workers had been hired to perform construction work in the UAE but the global financial crisis led to a collapse in oil prices and interrupted many UAE construction projects. Many workers who had been selected and hired in India (and other home countries) faced different probabilities of actually departing for their job depending on the date of their application. Clemens uses a 2011 survey of the full universe of the workers who had been hired by a major UAE construction company to estimate selection bias and thereby the causal impact of temporary migration on Indian households. The fact that this is data on workers who expressed interest and received offers for a construction job in the UAE narrows the degree of selection on unobservable characteristics, when the workers are compared to each other. The results show *positive* selection bias on observables for those *applying* for jobs abroad (they tend to be much higher skill than non-applicants) but *negative* selection into actually taking the job offer and working in the UAE. In this particular case the wage ratio controlling for observables *understates* the true gain.

Table 3: Clemens (2019) study of temporary construction workers from India working (or not) in the United Arab Emirates suggests positive selection on observables into applying and being hired for jobs in UAE but negative selection effects on unobserved characteristics among those taking up jobs.

	I *Unconditional wage difference, using nationally representative data*	*II* *Wage ratio, controlling for observables, using nationally representative data*	*III* *IV-2SLS (Instrument: oil price index on day of job application)*	*IV* *IV-DEV (Dummy endogenous variable IV model)*
Ln(wage)	2.76	1.3-1.5	1.381	1.337
Wage gap	15.8	3.6-4.4	3.98	3.81
Nature	Observed, unconditional, wage gaps	Observed, for observably equivalent workers (men, 30-34 years old, some secondary schooling)	Upper bound causal effect of guest work on wage - adjusted for intermediate selection bias	Lower bound causal effect of guest work on wage - adjusted for intermediate selection bias

Source: Adapted from Clemens (2019); Tables 2 and 4.

It is assumed, primarily on the basis of "intuition" or the casual observation of (or introspection by) "super-star" migrants, that the selection of migrants is nearly always positive (e.g. higher wages in the receiving country are due to unobserved characteristics) and potentially large (e.g. selectin can account for a large fraction of the higher wages of migrants than non-migrants). Relative to this Clemens (2019) demonstrates two points. One, when selection in a sophisticated way even the direction of the effect of selection on estimating the LATE of place depends on details of the type of migration, sector, and can be positive, negative or zero. Two, the empirics nearly always reveal that, for low to medium skill workers, selectivity can account for a relatively small portion of the wage ratios of observed equivalent workers.

McKenzie, Stillman, and Gibson (2010) provide an experimental measure of income gain from migration by leveraging the random migrant selection mechanism of New Zealand's Pacific Access Category (PAC). PAC allocates visa quotas for Tongans to migrate to New Zealand, outside New Zealand's migration policies for skilled workers or family reunification. Tongans file applications under PAC and if the number of applicants exceed the quota, a lottery is used to randomly select from amongst the applicants. McKenzie et al compare the expected income of lottery winners and losers to estimate (1) the intent-to-treat (ITT), or the effect of being selected in the lottery to migrate on expected income and (2) the average treatment effect on the treated (LATE) - the effect of migrating on the expected income of those who actually migrate. The idea is that the lottery randomly allocates applicates as winners or losers, creating a control group of individuals who do not migrant (remain untreated). Comparing the income of those who were selected in the lottery to the income of those who lost generates an experimental estimate of the impact of the treatment (winning the lottery) on the treated (winners) - the ITT. However, this is not yet the causal impact of *migration* on migrant income because of the possibility that some of the treated (lottery winners) may drop out of the treatment (choose to not migrate) - creating a bias in the causal impact of migration. The authors use an instrumental variable (winning the lottery) to estimate the effect on the treatment (migration) on the treated who were randomly selected for the treatment and complied with it (winners who migrated), and they find this to be a significant gain of 263%. The authors

also predict selection bias based on unobservable traits by comparing income of lottery applicants-vs-non-applicants (and winners who migrants-vs-winners who stay in Tonga) prior to applying (migrating). They find evidence of positive selection for those who apply to migrate, but no evidence of selection among those who chose to migrate.

Clemens and Tiongson (2017) study the impact on households of workers from the Philippines performing temporary work in Korea and use a natural policy discontinuity generated by the fact the migrants had to pass a Korean language test to be eligible to migrate. Comparing the outcomes of applicants just above and just below the threshold shows a significant and large - hundreds of percent - income gain from migration. Additionally, the migration of one household member increases household spending on healthcare and education and quality of life expenditures.

Clemens, Montenegro, and Pritchett (2019) review the existing literature and the range of methods for estimating selectivity (e.g. some countries use rotating panels that allow the estimation of the wages, conditional on observable characteristics, of workers who subsequently attrite from the sample due to migration) and find: (i) about as many examples of negative as positive selectivity on unobserved characteristics and (ii) there are very very few estimates from any method that suggest a correct to wage ratios conditioned on observable characteristics of more than 25 percent. The most conservative adjustment supported by the literature would be to reduce estimates of wage premia that condition on observables by a factor of around 1.25, so that the median wage gap across 42 countries on "observed equivalent" workers of 5 would be become a wage ratio of 4, though again, there is no theoretically or empirically supported argument that selection is uniformly positive and one could equally make the case the "typical" adjustment should be about zero unless there are specific arguments or evidence to the contrary.

Section 4: Are there unrealized gains from international mobility? Migration desires and action

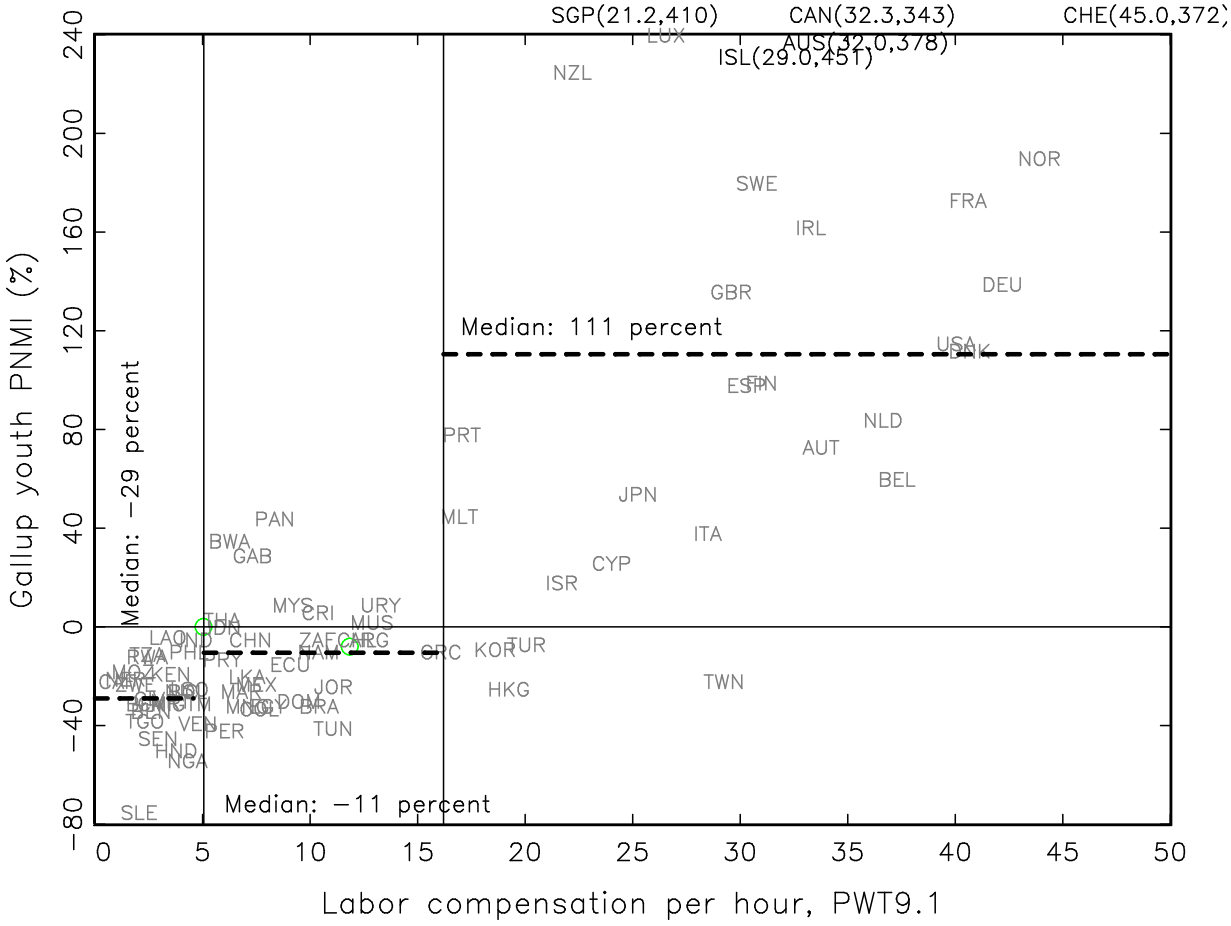
It might be the case that observed wage differentials represent an equilibrium that is not constrained by border-based restrictions to mobility. For many, many, reasons people have preferences to live in the country/region they were born/raised in. Hence, even in a fully integrated, zero policy-based restrictions to spatial mobility, one can expect real wage differentials to have long (if not infinite) persistence. It is possible, and some have suggested that, observed wage differentials are consistent with the observed relatively low levels of cross-national mobility because people do not want to move. However, one should be doubly careful of arguments made by those who enjoy a liberty but want to deny it to another on the grounds that "they" are "not like us" and "don't want" this liberty: once careful because of the obvious deviation from simple Golden Rule/Kantian "do unto others" morality and twice careful because such arguments, commonly made about various groups across history, have been proven empirically wrong again and again and again.

All the evidence is consistent with the idea existing cross-national wage differentials produce a demand for mobility that is sharply restricted by the coercively enforced border-based restrictions enacted by nearly all countries. Survey evidence suggests that many more people would like to move than actually do (Section 4.1). Moreover, both historical and contemporary evidence suggests that an equilibrium wage ratio for equal productivity workers across cultural distinct and geographically distant places is in the range of 1 to 1.5, not the factors of 3 to 5 to 10 we currently observe (Section 4.2).

4.1: Expressed intentions

The Gallup organization has since 2010 included in its rolling global survey questions about migration. The key question is: *"Ideally, if you had the opportunity, would you like to move permanently to another country, or would you prefer to continue living in this country?"* and then, of those who express a desire to move, "*To which country would you love to move?"* (only one response permitted). Using these numbers Gallup (2017) calculates a "Permanent Net Migration Index" (PNMI) which is the percentage change in the country population if everyone relocated to their preferred ideal location, which they calculate both overall and for levels of schooling and age groups. Figure 6 shows the plot of the Gallup youth (age 15 to 29) PNMI against the labor compensation hour per data from the PWT9.1. While clearly migration desires are based on many factors and not just wages (e.g. dissatisfaction with corruption, conflict, violence, anticipated growth, social networks in destination countries, political conditions) the results are striking that, for the median country in the bottom tercile of wages the youth population would fall by 29 percent if migration ideals were realized. In contrast, the median country in the top tercile of wages would see its youth population *double* (with the USA, the largest destination country in absolute terms, right at the median) and a number of smaller high waged countries (e.g. Singapore, Canada, Switzerland) would see their populations quadruple. There are clearly unrealized ideas of migration that would, if realized, occasion massive movements of labor and these are correlated with wages. That said, wages are of course are associated with GDP per capita and many other phenomena (e.g. democracy, freedom, lack of corruption, more equal opportunity, better education, lower crime) that would attract migrants and a variety of empirical exercises have examined the correlates of bilateral migration ideals (Migali and Scipioni (2018), Dao, Docquier, Parsons, and Peri (2018), Docquier, Peri, and Ruyssen (2014)).

Figure 6: Migration desires of youth and wages, if migration ideals were realized there would be massive changes in the population of youth across countries



Source: Author's calculations with Gallup (2017) and PWT9.1 data. Notes: N=83, High income oil countries and former Soviet bloc countries are excluded.

For economists (and all social scientists) it is hard to know exactly what to make of responses to hypothetical questions like these. There are arguments both that these may over-predict mobility if barriers were reduced and that these under-predict mobility. Since Gallup only asks about permanent, one suspects this understates the desire to move permanently or temporarily by a substantial margin. In surveys of youth 15 to 24 for *The World Bank Annual Report* (2007) youth were asked in seven countries: "If it were possible for you to legally move to another country to work would you?" with options "move permanently" "move temporarily"

"try it out" and "not move." In Bangladesh, which has a 23 percent youth PNMI of males only 9 percent said "not move"—so 91 percent (!) expressed some preference for moving but only about 5 percent said "move permanently" and about 60 percent said "move temporarily" and the remainder "try it out." In Ethiopia (with 38 percent youth PNMI) less than 10 percent said, "move permanently" and over 60 percent said "move temporarily" or "try it out." This is suggestive evidence that the Gallup forcing of responses into "move permanently" and "not move" both *overstates* the desire for permanent movement but vastly *understates* the desire for temporary labor mobility.

The Gallup poll also asks respondents about whether they have "plans" to move or have made "preparations" to move and some have pointed out these are more in line with actual measured bilateral flows (Gallup, 2018). This question is hardly informative. Suppose one were to ask women in a country where they legally could not vote if they, in an ideal world, would like to vote and then also asked whether they had plans to vote in the next election. An "ideal-plan" gap in those questions would only reveal that women expected the law to be enforced and would reveal nothing about the intensity of their desire to vote, nor the likelihood they would vote, if they could do so.

4.2: Mobility behavior and wage gaps

If border-based restrictions are creating wage differentials across equal productivity individuals who would like to move then we should observe that episodes of lowered restrictions should produce movements at high wage ratios and that permanently lower restrictions should produce low wage differentials.

4.2.1 Historical episodes of open borders

Up to the early 20th century there was near complete open mobility from Europe to the "areas of recent settlement" (USA, Canada, Brazil, Argentina, Australia, New Zealand, etc.) and there were substantial migration movements from many European countries. The work of Williamson (1995) constructs comparable (PPP) wages for urban unskilled occupations in a numbers of countries. Hatton and Williamson (1992) show very large emigration rates were consistent with what, by current standards, were modest wage differentials. Ireland has a gross emigration rate (to non-European destinations) of 1.6 percent per year from 1880 to 1889 and the real wage of the receiving areas to Ireland was only 2 to 1. In the aftermath of the Great Famine of 1845-1849 Ireland's population fell by outmigration by half from 1850 to 1900 (so a youth PNMI of 50 percent needn't be unrealistic), while the real wage ratio of receiving countries to Ireland never exceeded 2.7 to 1 (Hatton & Williamson, 1992, Table 2). Italy from 1900 to 1913 had a gross emigration rate of 1.8 percent per year and the unskilled wage ratio for receiving countries to Italy in that decade was 3.4 to 1. Even in periods in which travel was slower, communication more difficult and costly but migration was legally possible, PPP adjusted wage ratios less than half many of those currently observed generated mass mobility and large population shifts.

4.2.2 Culturally distinct and geographical distant labor markets

The existence of much smaller real wage gaps within countries and evidence, for instance, that one would expect relative small steady state differences in wages of equal productivity workers across US states, even with substantial moving costs and home preference (Kennan & Walker, 2011), isn't compelling evidence that cross-national wage gaps are not maintained by binding constraints, as it is possible that the psychic dis-utility of moving is smaller within a country, for a variety of reasons. More interesting is the comparison of

culturally distinct (and sometimes geographically distant) but legally integrated labor markets, some of which exist due as the result of colonial history. The wage ratio for low skill, private sector workers between Reunion (a small Island off the east coast of Africa that is an overseas department of France) and France is only 1.18 and between Guadeloupe (a Caribbean French overseas department) and France only 1.35. Puerto Rico is a Spanish speaking Caribbean island which is a US territory and Guam is a small Pacific island, but the residents of both US Territories are US citizens hence can freely travel to and work in the USA. Applying the Clemens, Montenegro, and Pritchett (2019) estimates to Puerto Rico and Guam produce estimates of 1.56 and 1.31. These are larger than within the USA but are very small compared to the lower bound, selectivity adjusted, estimates for other Caribbean countries (even with large US based social networks): Haiti at 4.87 or Jamaica at 3.78, or a distant Pacific country (with strong historical US ties like the Philippines at 3.47.

4.2.3 Existing mobility behavior

Three types of contemporary evidence suggest the legal constraints are binding in constraining the magnitude of mobility and maintain much larger wage gaps than possible with free mobility.

First, there are instances of recent relaxations of barriers to mobility that show immediate large flows. The UK allowed for immediate free mobility with the accession of Poland to the EU and the Polish born residents of the UK increased from less than 100,000 to over 500,000 in just four years (Barrell, Gottschalk, Kirby, & Orazgani, 2009), whereas the wage differences in the GDP data suggest a PPP wage gap of less than 2 to 1 (Budnik, 2009). In general, mobility is neither immediate, nor total, but can be cumulatively large, even with modest wage differentials, wages in East Germany were 70 percent of those in West Germany even by 1995 (Burda, 1995).

Second, some countries, such as the oil rich Gulf states and Singapore, maintain high flows, relative to population, of workers who are allowed in under very strict conditions. Workers are often allowed only on short-term contracts, lack pathways to citizenship, there is no expectation of equal wages with citizens, there is a risk of fraud (in both recruitment and in the host country) and even the risk of abuse. Yet even in those conditions there is evidence of excess demand in expressed ideal location and in practice. In the Gallup youth PNMI the Gulf states would be massive gainers, even from their current high levels: Bahrain 72%, Saudi Arabia 114%, United Arab Emirates 330%, Kuwait 349%. The Gulf states can demand that applicants for work, even in unskilled trades in construction, meet many requirements. Moreover, in the relationship between actual and potential sending countries and the receiving countries it is clear there is excess demand for the placement of workers, not an unmet demand for workers.

Third, the existing differentials in wages (and living conditions more broadly) do induce people to pay high costs in travel and to brokers and suffer physical risks of death to cross borders and gain physical entrance at rates that tragically belie the notion existing differentials are an coercion free equilibrium. Obviously counting migrant deaths is difficult and has high uncertainty. The IOM (Reineke, Martínez, Brian, & Laczko, 2014) estimated a total of 22,400 deaths of migrants attempting to enter Europe between 2000 and 2014. The Missing Migrants Project (IOM) estimates deaths of potential migrants to Europe between 2014 and 2018 over 38,000. The US Border Patrol estimates migrant deaths crossing the US border with Mexico between 1998 and 2017 were 7,220[6]. The total US military fatalities from the Afghanistan war have been 2,216 and 4,497 in Iraq. The total deaths of those attempting to cross the Berlin Well are estimated to be 245, which is roughly the deaths per year along the US-Mexico border.

[6] ("Southwest Border Deaths By Fiscal Year," 1998-2018)

Bah and Batista (2018) report on a "lab in the field experiment" in rural Gambia of the empirical relationship between expressed willingness to migrate illegally to Europe and expected risk of death in doing so. Of the 406 interviewed 46.5% (189) expressed a willingness to migrate illegally to Europe and of that group their average expectation was a 43 percent chance of dying en route. When provided with the researchers' "correct" estimate that the probability of death was "only" 20 percent, this increased the willingness to migrate illegally by 2.3 percentage points. Literally the day this section was being drafted (October 28, 2019) in the UK there was a headline about a young Vietnamese woman who had died while being smuggled into the UK who texted her mother "I'm sorry Mom, I am dying."

4.2.4 Existing enforcement costs

Countries spend considerable sums enforcing their restrictions on mobility. The United States of America in Fiscal Year 2019 budgeted 24.7 billion dollars to the US Immigration and Customs Enforcement (ICE) and US Customs and Border Protection (CBP) and has spent 324 billion on border enforcement since the creation of the Department of Homeland Security in 2003 ("The cost of immigration enforcement and border security," 2019). As a reference point, this is more than the US foreign assistance budget for health, humanitarian assistance, economic development, democracy and human rights, and multi-sector activities *combined,* US$19.6 billion ("ForeignAssistance.gov").

Section 5: Aggregate theories of the level and growth of output and labor mobility

The previous sections have relied entirely on data from and about individuals: wages, expressed intentions, and observed mobility behavior. Economics also of course has generated theories and evidence about the sources of cross-national differences in income. Lucas (1990)

famously argued it was "hard to think about anything but" questions in economics like: "why are some countries rich and others poor?" the related question "why is there rapid growth in some country/periods and why do other country/periods involve slow growth/collapse?" and "What, if anything, can be done about it?" The most recent version of PPP comparable national accounts shows that the standard macroeconomic models provide estimates of the gap in wages (adjusted for human capital) or marginal product of labor that are consistent in magnitude with the microeconomic evidence (Section 5.1) Reconciling the theories of cross-national income differences with observed wage gaps of equal intrinsic productivity workers is important as a dominant interpretation of "workhorse" growth models that emerged in the 1960s, 1970s suggested that incomes would converge across countries without labor mobility, but these predictions have been proven false (Section 5.2). The current "best" available theories about cross-national differences in labor productivity do not generally predict absolute income convergence in the absence of labor mobility (Section 5.3).

5.2 Macroeconomic estimates of wage differentials and their sources

The Penn World Tables are a collection of national accounts data and estimates of PPP that allow the comparison of levels of national income across countries and over time. They also provide data on capital stocks and estimates of human capital that allow the calculation of measures of TFP. The PWT9.1 (Feenstra, Inklaar, & Timmer, 2015) is the latest iteration of this data and makes possible three calculations informative about wage gaps across countries.

First, the national accounts estimate of annual labor compensation[7], adjusted to equal hours (2080=52*40), is:

$$4)\ Annual\ labor\ compensation = \frac{GDP}{Workers} * (Labor\ Share) * (\frac{2080}{hours})$$

Regressing this measure of wages on the log of capital per worker and on the PWT9.1 index of human capital (constructed from data on years of schooling and returns) and the recent World Bank data on learning and the interaction of these two "human capital" variables generates coefficients to predict the annual labor compensation per worker at 2080 hours for all countries if, instead of their own human capital measures they were at the 33rd percentile[8]. Hence this "nets out" the contribution of human capital (as measured) to country wages.

The results in Column I of Table 4 show wage gaps, adjusted for human capital, modestly larger in absolute terms and in ratios than the microeconomic evidence (Section 2) by level of schooling and occupation (part of this may be due to the difference between reported wages and labor compensation). The ratio of human capital adjusted annual labor compensation of the USA and OECD to the 33rd percentile is 6.5 to 1 and 4.9 to 1. A simple bivariate regression suggests that 60 percent of this variation in "human capital adjusted wages per hour" is associated with the PWT9.1 reported measure of TFP.

The second calculation is just a simple calculation of the marginal product of labor assuming a Cobb-Douglas production function in physical capital, human capital, and labor with shares of 1/3 each. In this simple case:

[7] Labor compensation isn't "(net) money wages" as labor compensation includes costs to firms like benefits and taxes and other costs but for simplicity, we will refer to this was "wages."

[8] These calculations use data from the countries that have A data in the PWT91 (which is 117) and then loses some countries as they do not have World Bank learning data (4 countries), as well as high income oil countries (e.g. Saudi Arabia, Kuwait) as they are economically quite distinct (6 countries) (and it mostly doesn't matter as the authors report results for the bottom 1/3 and the OECD). Hence the sample includes 107 countries.

$$5)\ MP_L = \frac{dQ}{dL} = \frac{Q}{L}\alpha_L$$

This generates differences of the USA and the OECD to the 33rd percentile of 5.2 to 1 and 4.4 to1. In this case the R2 with the TFP measures is .62.

Table 4: Calculations of wage (labor compensation) gaps using GDP data, adjusted for PPP show similarly large gaps in wages, even adjusted for human capital, driven in large part by differences in measured A

	I Wages (annual labor compensation per worker, adjusted to same hours) if each country were at same point (33rd percentile) of human capital (HC from PWT91) and measured learning (HLO from World Bank)	II Cobb-Douglas calculation of marginal product of labor (labor coefficient=1/3)	Total factor productivity (A) of country relative to USA (=1)
Average of bottom tercile	$3,224	$4,244	0.37
First tercile (33rd percentile)	$8,455	$8,682	0.52
USA	$54,879	$45,422	1.00
Ratio Tercile I to USA	6.49	5.23	1.93
OECD	$41,566	$38,350	0.86
Ratio Tercile I to OECD	4.92	4.42	1.65
90/10 Ratio	47.60	16.06	3.14
Bivariate regression R2 on A	0.60	0.62	1.00
Number of countries	107	107	107

Source: Author's calculations using PWT9.1 data and World Bank data on learning outcomes (Angrist et al., 2019).

Column III reports results on the PWT9.1 measure of A relative to the USA (=1). The 33rd percentile country has A about half that of the USA and average OECD productivity is about .86 of the USA (so about 60 percent higher than the 33rd percentile, a bit more than twice as high as the bottom third on average).

5.2: "A" (TFP) did not converge (much, for a long time)

Solow (1956) proposed a model to study economic growth which, in its current versions (e.g. MRW) assumes a production function in which output per worker differences (over time or across countries) can be decomposed into physical (K) and human (H) capital and total factor productivity (A). "A" (TFP) is empirically only a residual and hence a "measure of ignorance" (Abramovitz, 1956).

One particular interpretation of this model (and its extensions) guided the early generation of economic development research and practice. If A was interpreted as "technology" or "knowledge" or "codes and blueprints" A is a potentially public good (non-rival and non-excludable), though of course patents and other types of intellectual property restrictions attempt to create excludability. In this interpretation of A as "technical" knowledge, it should diffuse easily and hence one could expect A to converge rapidly across countries. If A converges fast then countries with low K/L and low HK/L will have high productivity and hence high returns to factor accumulation. This will create potential for rapid factor accumulation through both domestic savings and, possibly, foreign savings as capital will want to move to high A/low K/L, H/L places. Therefore, in this interpretation, labor did not need to migrate as the movement of labor was thought to be slower and more difficult than capital but the fast convergence of A plus accumulation driven convergence in K/L and HK/L would equalize wages, reducing and then eliminating labor mobility pressure.

In this model one could believe that the pace of factor accumulation is limited by savings that could be mobilized (domestic and foreign) and hence, As Arthur Lewis (1954) famously wrote:

> *"the central problem in the theory of economic development is to understand the process by which a community which was previously saving, and investing, 4 or 5 per cent of its national income or less converts itself into an economy where voluntary saving is*

> *running at about 12 to 15 per cent of national income or more. This is the central problem because the central fact of economic development is rapid capital accumulation."*

The core working growth models of the IMF and World Bank assumed that growth was limited by investment, which was limited by domestic savings, and filling the "financing gap" was key to growth (and these models were used in practice long after the economics profession have given them up (Easterly & Levine, 1997)).

However, the plausible sequence of: "A converges fast, then factor accumulation flows (limited by pace of domestic and foreign savings) cause convergence in factors per worker, the combination of which cause convergence in income per worker" did not happen[9]. What is striking is that this is at least in part because *A (TFP) did not converge*. Bosworth and Collins (2003) provide a standard "growth accounting" exercise by region between years 1960 and 2000. In three regions, Middle East, Latin America, and Africa there was absolute income divergence and a large part of this was that A grew *slower* than in the OECD. Even in the two regions with income convergence (East Asia (not including China) and South Asia) A growth was only at exactly the same rate as in the OECD and convergence is driven by faster growth in physical capital accumulation. The Penn World Tables 9.1 data provide new capital stock estimates and estimates of A growth based on the national accounts data in real (constant, local currency) units. These show the same fundamental features. Over the entire period since 1960 the median annual A growth in *every developing region* was slower than in the OECD. Only in East Asia (without China) and South Asia (which in this data is just India and Sri Lanka) outperformed even the slow A growth of the OECD post 1990 of .3 percent per annum.

[9] Until recently. Patel, Sandefur, and Subramanian (2018) argue there is evidence for unconditional convergence since 1995.

Table 5: Standard growth accounting exercises show that measured A growth in developing countries regions was about the same or lower than the OECD: No convergence of A on average

	Bosworth and Collins (2003)				Annual total factor productivity growth estimates from PWT9.1 (median by region; percent)				
Region	N	Growth in output per worker 1960-2000 (%)	Contribution by source of growth, 1960-2000		1960-1990		1990-latest		1960 to latest[a]
			PK per worker (%)	Total factor productivity (A) (%)	A	N	A	N	A
Industrial	22	2.2	0.9	1.0	1.06	25	.29	25	.63
East Asia (except China)	7	3.9	2.3	1.0	.51	8	.46	12	.20
South Asia[b]	4	2.3	1.0	1.0	.38	2	1.05	2	.60
Middle East[c]	9	2.1	1.1	0.5	.54	5	-.10	5	-.26
Latin America	22	1.1	0.6	0.2	-.32	19	-.08	20	-.25
Sub-Saharan Africa	19	0.6	0.5	-0.1	-.47	13	.07	26	-.26

Source: Bosworth and Collins (2003); Table 1 for first five columns. The last four columns are the author's calculations using the PWT9.1 data, which included adjustments for the composition of capital, using the *rtfpna* variable and are least squares growth rates over the periods.

Notes: a) this calculation uses all available data since 1960 for each country which is at most to 2017, b) the only South Asian countries with data, c) this calculation uses only the non-oil Middle East countries from the PWT9.1 as the measured productivity growth of the high oil countries is very low.

"Growth decomposition" exercises consistently find that differences in A account for most of the differences in GDP per capita. Hall and Jones (1999) argue A differentials explain the majority of the output gap between the countries: A gaps between the five richest countries and five poorest countries in 1988 contributed a factor of 8.7 to output gaps, compared to much smaller factors for physical and human capital (1.8 and 2.2 respectively). Caselli (2005) assesses cross-country output gaps and shows that physical and human capital only accounted for 35% of the 90-10 percentile gap in per capita income. Inklaar, Woltjer, and Gallardo-Albarrán (2019) use more sophisticated data to measure capital stocks to be sensitive to the composition of the capital stock. While these does increase some of the measured impact of capital, they still

conclude that A differences account for about 2/3 (.648) of the observed differences in GDP per capita.

If A does not converge, then returns to capital in low income countries with low K/L are not necessarily high. The latest PWT9.1 data includes estimates of the "internal rate of return" to capital. Simple regressions of those returns on capital stock per worker, A relative to the USA and their measure of human capital finds a modest sized partial correlation of IRR and K/W, such that moving from the 25th percentile of K/L (P$31,220 per worker) to the 75th percentile of K/L (P$220,504)—a seven-fold increase--only reduces the IRR by about 3 to 5 percentage points. Caselli and Feyrer (2007) suggest that marginal products of capital have converged (even if K/W hasn't), a finding confirmed recently (Lowe, Papageorgiou, & Perez- Sebastian, 2019), only with the caveat that this appears to be truer of private than public capital.

5.3 Models of persistent gaps in A

Empirically A is residually measured and hence is both model dependent (how one "accounts" for "factors" determines the measure of A) and ultimately a "measure of ignorance." The *interpretation* of A as "technical progress" was always only a conjecture about what accounts for the observed differences in measured productivity and its components. The "technical" interpretation of A in the Solow model was influential in suggesting the possibility of (rapid-*ish*) convergence in absolute income (and wages) across countries without labor mobility, which helps explain the relatively little sparse attention to labor mobility in development and international economics. However, there are at least four other interpretations of the sources of productivity gaps, each of which has its own implications for pressures for labor mobility and for its consequences on movers, receiving countries, and sending countries.

5.3.1 A and "institutions"

The literature on "institutions" suggests that cross-national TFP and its dynamics is not the diffusion of technical knowledge but rather whether countries can create "rules of the game" that support high productivity of factors (Hall and Jones (1999), Rodrik, Subramanian, and Trebbi (2004), Acemoglu, Johnson, and Robinson (2001), North, Wallis, and Weingast (2009)). In these models there are not necessarily predictions of convergence of "institutions" towards high TFP. Nunn (2007) and Dell (2010) demonstrate very long-lived effects of history (via slavery in Africa or the *mita* in Peru) on current levels of income across places (even within countries). In many of these "institution" models of growth and A there were no "policy recommendations" as there was no theoretically and empirically grounded models of the dynamics of "institutions" that had "policy levers" and "institutions" might only change at "critical junctures" (Acemoglu et al, 2001)--hence, long term persistence of low levels of income was a possible, even common, outcome.

If TFP is determined by "institutions" and "institutions" have large degrees of persistence then this is a powerful case for labor mobility as in "productivity world" factors flow to places where productivity is high, not necessarily where K/L is low (Easterly & Levine, 2001). Movers are better off as the LATE of place is large due to large A differences, receiving countries are roughly neutral (a bit better off) as A is impervious to most levels of mobility, and sending countries are roughly neutral (a bit better off) as since movers do not predictably change the dynamics of A or growth there is no long term loss (and K/L goes up). There is an emerging literature that suggests there might be non-linear impacts of migration on A as "institutions" are supported by norms that migrants may not share, but the empirical evidence suggests that most countries are far from this level of migration and that, even with a possible level of "A

deteriorating migration", the current levels are far *lower* than optimal (Clemens & Pritchett, 2019).

5.3.2 A and "capabilities" and "structural transformation"

Hausmann, Hidalgo et al. (2014) propose a model that does away with "A" altogether. In their model country (and regional) productivity depends on product specific, Leontief-like production functions in "capabilities" where more complex products require more (and rarer) capabilities. These "capabilities" take a variety of forms, some are physical infrastructure, some are standard tradable inputs, some are legal/policy facilitating/enabling regulations/laws, and some are practical tacit knowledge of how to combine all of these and produce goods. They often explain their model by analogy with a game of Scrabble - the player with more letters is more productive because he can produce more and more complex words, compared to players with few letters, who only makes shorter and fewer words. At least some capabilities are place specific and non-tradable.

This model also suggests high and persistent pressures for labor mobility. First, this model has the feature that the productivity of a given unit of human capital is dependent on the place specific availability of other factors to combine with—so cities are far more productive than rural areas. Second, this model can generate situations in which the returns to acquiring new capabilities are high when there are already more capabilities, and hence agglomeration economies so that it is hard to draw, say, new capital investment, to low productivity places and hence a lack of pressures for convergence in productivity. This implies that (a) there are, potentially large, differences in the productivity of labor (or various "types") and hence gains to movers, (b) high capability economies have high productivity from diversity, not just "magnitude" of capabilities and hence productivity is not deteriorated, and could be enhanced,

by labor mobility (and this is even more true for developing countries that need to bring people to bring tacit knowledge), (c) senders do not lose from outward migration of low/medium skill labor as they have these capabilities (often in abundance) and really need diversity (Easterly, 2004), (Hausmann, 2015), and (d) capability growth in many developing countries is expected to be very slow. Andrews, Pritchett, and Woolcock (2017) construct a "capability index" to measure a country's policy implementation capability level and growth[10]. They reveal a "capability trap" problem for countries with weak and very weak capability today - that is most countries are witnessing deteriorating capability or very slow growth such that the time horizon needed for these countries to reach high capability is infinite.

5.3.3 Intrinsically spatial productivity and optimal population

A third explanation of differences in A are intrinsically spatial models of productivity, often building off of resources. That is, even with equal "institutions" and policies people often locate in a specific place because of its specifically spatial features—e.g. the soil/climate/water availability are good at producing wheat (or rice or rubber or coffee or etc.), there are valuable minerals on or under the ground, or it is near a port or cross-roads (or not). If there are spatially specific productivities that are sources of product specific comparative advantage then this, particularly when combined with any non-linear agglomeration economies of the types that produce cities (Black and Henderson (1999), Ellison and Glaeser (1999)), then there is the possibility of large, persistent, shocks to place specific productivity and hence "optimal" population.

[10] Andrews, Pritchett, and Woolcock (2017) construct the Capability Index using cross-national measures of (1) Quality of Government and selected indicators from (2) the Failed State Index and (3) World Governance Indicators. Hence capability is characterized broadly to include: Law and order, bureaucratic quality, corruption control, public services/ government effectiveness (rating infrastructure, education and health systems, policing). The Capability Index allows categorizing countries by (a) capability level: very weak, weak, middle, strong; and (b) capability growth rate over time: Rapid negative, negative, positive, rapid positive.

Pritchett (2004) shows that even within in a large, integrated, mostly "institutionally" homogenous country like the USA there has been massive labor mobility. The variance of population growth rate of spatially contiguous regions (made up of USA counties) is orders of magnitude larger than across similarly sized developing countries. This suggests a combination of enduring spatial shocks to optimal population. On the other hand, the variance in the growth and level of income per capita is much smaller within integrated regions than across all developing countries (where the dispersion of wage growth is massive). Pritchett constructs the population of declining US counties, had out-migration been restricted, and finds that the counties' actual population in 2004 is third what it would have been in the no-migration case. This means that even in spaces with perfectly free trade, perfectly mobile capital, and more or less equal "institutions"[11], labor mobility happens in large amounts that are consistent with large, persistent, shocks to intrinsically spatial productivity. While capital, both physical and human, could have migrated to these shrinking counties, that is not the dominant feature of what happened, mostly labor migrated to other counties within states (e.g. urbanized) and to other states.

Zambia, for example, who's GDP per capita peaked in 1964, had a population of 3.5 million then which would have fallen to 2.52 million in 2004 had out-migration been as free as it is among US counties. Instead, Zambia's GDP per capita in 2004 stood at 59% of its peak and its population had *increased* to 10 million as out-migration to high productivity places was limited. This is in sharp contrast to the historical experience with Ireland, in which in response to the positive shock of the potato (as a cheap source of calories amenable to Ireland's conditions) population grew and then, following a blight to the potato in 1847 (and onwards) Ireland's

[11] And the outward mobility is often from "good institution" places like the Midwest, not just from "bad institution" places like the rural Deep South.

population fell to *a third* of its previous level—and real wages relative to the UK never fell—because this was in a period of free labor mobility (for the Irish), including to areas of recent (Western) settlement like the USA.

Section 6: Gains from relaxing barriers to labor mobility

The fields of international economics and "welfare economics" have developed tools and models for measuring the magnitude of efficiency losses from policy interventions in markets and of border-based obstacles. Recently the Nobel Prize in Economics was awarded for researchers using randomized control trials to investigate the gains to poverty focused interventions. Using either those approaches reveals that the gains at the margin from relaxation of border-based restrictions on labor mobility are currently orders of magnitude larger than gains from further liberalization or from *in situ* interventions (Section 6.1). The general equilibrium extensions suggest similar gains (Section 6.2)

6.1: Gains at the margin

While not a good stopping point, simple arithmetic is a good starting point. The Gallup (2017) data suggest that 750 million people say they would move permanently if they could. If all of these were workers and real consumption wage gains to of the typical mover were P$15,000 the gains would be 11.25 trillion dollars. That is roughly three times as big as the entire German economy.

6.1.1 Gains from international liberalization

Simple partial equilibrium calculations of the welfare losses from price distortions of the "Harberger Triangle" type start from the basic area of the triangle is ½*base*height where the "height" is the price equivalent of the distortion and the base is the magnitude of the market.

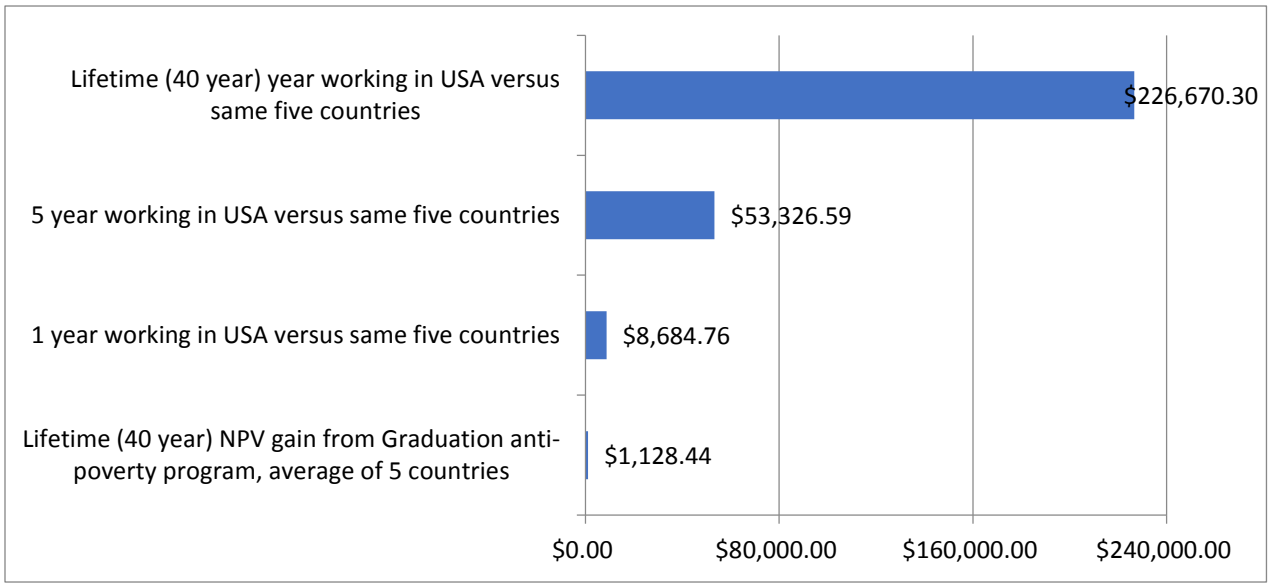
Nearly all analysis of welfare losses from price distortions—in trade, from subsidies, from market regulations—start with estimates of the price equivalent of the distortion and these are nearly always measured in percent. Most of our discussion of wage price distortions have been in terms of factor multiples, like 4, which one needs to multiple by 100 (two orders of magnitude) to get to percent. Given that nearly all border based price distortions in goods trade in OECD countries are less than 10 percent and the wage distortions for low/medium skill labor are on the order of 400 to 1000 percent one should expect small relaxations in labor distortions to be similar in magnitude to the complete elimination of the small restrictions on trade. With the demise of the Doha round negotiations—and the, not unrelated, general push-back against "globalization"--there have been fewer calculations of the gains from further liberalization of the flow of goods and services using standard economic models. Walmsley and Winters (2002) using a standard computable general equilibrium model (GTAP) estimate that the gains from a 3 percent increment to the OECD labor force by relaxing restrictions on temporary mobility on developing countries would produce net gains (adding gains to movers, receiving countries, and sending countries) of US$156 billion. This is 50 percent more than estimated gains from a complete liberalization of trade in goods and services of $104 billion.

6.1.2 Gains from in situ *development interventions*

The 2019 Nobel Prize in economics was given to a trio who extended the use of randomized control trial (RCT) methods to the evaluation of anti-poverty programs. A high profile article in *Science* magazine (Banerjee, Duflo et al., 2015) reported on the evaluation across six countries of a multi-pronged "Graduation" livelihoods program that had been developed and implemented by the NGO BRAC. A rough summary is that, average across the

five countries in which the program worked[12], the program spent $4,545 per household in the first two years of program implementation and generated $344 household gain in year 3. If one assumes a 5 percent discount rate and that the $344 gain persists for 40 years the NPV of the program to the household is $1,128. The authors claim this is the new "gold standard" of evidence based anti-poverty program.

Figure 7: The Net Present Value gains to low skill workers from access to rich country labor markets is orders of magnitude larger than of the best rigorously demonstrated poverty programs



Source: Author's calculations from Banerjee et al. (2015) and CMP (2019)

If one uses the lower bound for wage differentials equal productivity reference category workers for those same five countries, the annual gain is $13,119 (again, this is a serious *under*statement of the gains from mobility as it assumes all the wage gain is spent at the, higher, prices in the USA than in the home country). If one assumes a $2,000 each way mobility cost,

[12] The five countries are: Ethiopia, India, Pakistan, Ghana, and Peru. This excludes Honduras where the livestock asset transferred to the poor was chickens and most of them dies of a disease. Conceptually this country should not be excluded in estimating the ex-ante distribution of program impact as this is a real risk. It is also worth mentioning that an impact evaluation of the same type of livestock asset transfer program in a different state of India had no impact as the local economy was growing and the returns to moving to jobs was higher than accepting and tending additional livestock (Murdoch South Asia program India). Hence all the calculations are generous (upward biased) estimates of "average" program impact.

then the gains from one-year access are roughly 8 times the lifetime gain and the "lifetime to lifetime" gain for mobility is 200 times higher. The gains do not end here. Migrants' extended families are made better off due to the channeling of income gains from migrants to their households in sending countries, allowing them to invest in human capital accumulation of family members (Yang, 2008, 2011). (Nunn, 2019) discusses out-migration from sending countries as the basis for country development strategies, given the role remittances can play, or the role of the diaspora in generating new international business links between sending and receiving countries.

6.2 Gains from "open borders"

The steady-state gains from "open borders" are a bit whimsical in current (or foreseeable) political circumstances and in terms of the strain they put on assumptions about being able to correctly model GDP far outside current conditions. The outcome is reasonably predictable: if lots of factors, especially labor, is working at very low levels of productivity then allowing all factors to move (and all the adjustments to capital, human capital, etc.) is going to produce very large gains. Hamilton and Whalley (1984) estimated a rough doubling of world GDP. There since have been a number of alternative estimates, many of which demonstrate a wide range of possible outcomes depending on the assumptions made (Moses and Letnes (2004), Iregui (2005), Klein and Ventura (2007), Bradford (2012)), with a plausible low end range of 10 percent and upper range of 100 percent and one could split the difference at 55 percent. As world GDP is US$133 trillion the plausible *pessimistic* estimates suggest gains of 13 trillion and the "split the difference" would be a gain of 73 trillion. As one comparison, a CGE modeled estimate of GDP losses in 2100 from 4°C warming versus 2°C warming are US$17.5 trillion (Kompas, Pham, & Che, 2018).

A recent objection to these large gains general equilibrium calculations is that they assume that TFP ("A") in the high A countries is not affected by migration and that there might be non-linearities in the relationship between A and migration such that "too much" migration deteriorates A. Clemens and Pritchett (2019) take this possibility seriously and model this possibility and attempt a calibration of the parameters of such a model. That paper has three findings. First, there is no current evidence in OECD countries of an association between the TFP weighted migrant stocks and growth in TFP, in spite of this measure of migration already differing across OECD countries by an order of magnitude. Second, the conceptually relevant measure is not the "stock of the foreign born" but the "stock of the foreign born that cause deterioration in A" and that this requires very specific assumptions about the dynamics of institutions and the dynamics of "assimilation"—in the narrow sense of the extent of pressure on reducing A—and how this is affected by the mix of migrants, none of which we have particularly good data or theory on. Third, even in models where a sudden, rapid, change in migrant stocks could reduce A there are, in a calibrated model, "optimal control" paths of migrant dynamics that get to very high stocks of the foreign born without any impact on A and these "optimal" paths suggests flows of migration much higher, not much lower, than current flows.

Conclusion

It is easier to spot elephants than mice and to spot mice than the fleas that live on the mice. The elephant in the room of discussions of "globalization" and international economics is that, while markets for goods and capital have been increasingly liberalized by policy and integrated by technological changes (Baldwin, 2016), and hence "true" price differentials are small and hard to measure, the international economics of labor mobility is pretty simple. There are massive differences in the real consumption wages of equal intrinsic productivity workers

which depends on their place. These wage differences are maintained by border based restrictive policies erected and enforced by countries which prevent workers from moving to opportunity. The economic losses from these restrictions, mainly to thwarted movers but also to the receiving countries themselves, are the largest policy induced welfare loss in the world today, quite possible in the history of mankind. The gains to human well-being from more and better flows of workers between countries are an order of magnitude larger than feasible "interventions" to people *in situ*.

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