The well-being of nations:

Estimating welfare from international migration

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Measuring the welfare of nations

Limitations of GDP as a measure of welfare.

New method of estimating welfare based on revealed preference.

Key idea: People tend to move from low-welfare countries to high-welfare ones.

Paper in one slide

Data

Gross bilateral international migration flows.

Discrete choice model

Every person chooses country of residence (including staying), given bilateral moving costs and *welfare level of each country*.

Estimation and identification

Recover welfare estimates and project onto observed country factors.

Conclusion

GDP is a good measure of welfare, but other factors matter too.

Contributions

Our estimates rely on different assumptions and data compared with previous work

- Combine factors; Surveys of well-being. Ram (1982), Slottje (1991); Easterlin (1974), Krueger et al. (2009)
- Calibrated $U()$ and measured consumption, leisure, mortality Jones & Klenow (2016)

We provide micro-foundations for gravity in international migration flows

- Existing micro-founded models imply w must rise w/ destination size. Anderson (2011)

We extend within-country QOL estimates from spatial equilibrium Roback (1982)

- Country utility varies; Our estimates incorporate housing costs and income.

Model

Setup

J countries with population sizes $\{N_j\}$

Each person i in origin $o \in J$ maximizes utility U by choosing destination d.

$$U_{od}^i = u_d - c_{od} + \xi_d + \epsilon_{od}^i$$

$u_d \equiv Z_d'\alpha$	Destination d's welfare level.
$c_{od} \equiv X_{od}'\beta$	Cost of moving from o to d ($c_{od} = 0$ if $o = d$).
ξ_d	Unobserved destination factor d.
ϵ_{od}^i	Gumbel with location $\gamma \ln N_d$ and shape 1.

Larger countries offer more opportunities

Probability that a person in o chooses d:

$$\pi_{od}^{i} = \frac{\exp(u_d - c_{od} + \xi_d + \gamma \ln N_d)}{\sum_j \exp(u_j - c_{oj} + \xi_j + \gamma \ln N_j)}$$
$$= \frac{N_d^{\gamma} \exp(u_d - c_{od} + \xi_d)}{\sum_j N_j^{\gamma} \exp(u_j - c_{oj} + \xi_j)}.$$

i.e., equivalent to standard logit where each person receives N_d^{γ} draws.

Why?

Fits intuition

E.g.: Countries AB & C; Identical regions A, B, C; No migration costs.

Fits gravity in migration flows

Flows (i) $\searrow$ with d_{od}; (ii) $\nearrow$ with N_o; (iii) $\nearrow$ with N_d.

Standard choice models rationalize (i) & (ii). Our model also gets (iii).

Anderson (2011) achieves this by requiring wages, utility to $\nearrow$ with N_d.

Omitting this feature may bias welfare estimates towards larger countries.

Estimation

Estimation in two steps

1. Estimate δ_d using conditional logit: (cf. BLP inversion)

$$\max_{d \in J} U^i_{od} = \delta_d - X'_{od}\beta + \nu^i_{od}.$$

2. Estimate α and γ using OLS or lasso:

$$\delta_d = Z'_d\alpha + \gamma \log N_d + \xi_d.$$

Two estimates of country welfare:

Projected estimate: $\hat{u_d} = Z'_d\hat{\alpha}.$

Unprojected estimate: $\hat{u}_d = \hat{\delta}_d - \hat{\gamma} \log N_d.$

Discussion

Unprojected vs. projected estimates

Unprojected estimates omit welfare-factor coefficients $\hat{\alpha}$.

Instead, use $\hat{\hat{\delta}}_d$ and correct for the model-implied rel'p btw. opportunities & N_d.

Unprojected estimate includes unobserved factors ξ_d (e.g., immigration policy).

Identification — projected estimate

N_d may directly affect welfare, beyond factors Z_d. (e.g. national pride).

If unobs. migration policy $\nearrow$ with country's *overall* utility, ranks may be preserved.

We are interested in *prediction*, not causal effects.

Results
Step 1 — $\hat{\delta}_d$

Data and method

Bilateral migration flows between 2005–2010 — Abel & Sander (2014)

Census tables of stocks of migrants by country of residence $\times$ country of birth.

Adjusted for mortality.

Bilateral factors X_{od} affecting migration costs

Distance, shared border, common language, colonial relationship, etc. — CEPII

Estimation using conditional logit

Every person faces same choice set, i.e., every country.

Choice specific factor (δ_d) and individual–choice specific factor (X_{od}).

Origin–destination factors predict migration flows

1_{Diff}	-3.337^{c}
	(1.262)
$1_{Diff}\times$ Log distance	-0.962^{c}
	(0.194)
$1_{Diff}\times$ Shared border	1.518^{c}
	(0.282)
$1_{Diff}\times$ Common language	0.700^{c}
	(0.128)
$1_{Diff}\times$ Colonial link	1.415^{c}
	(0.183)
N	1.14e+12

First-stage estimates. Standard errors robust to clustering by origin country reported in parentheses. ^{a}—$p < 0.10$; ^{b}—$p < 0.05$; ^{c}—$p < 0.01$. 179 countries $\times$ 6.39 billion people. $=$ 1.14 trillion.

Step 2 — $\hat{u}_d$

Data

Welfare factors Z_d

PWT, WB, UNU-Wider WIID, ILO

Log GDP per capita,

Average weekly work hours,

Gini coefficient of income,

Public share of total health expenditure (not private out-of-pocket),

Infant mortality,

Control of corruption,

Contractibility and confidence in rule of law,

Population-weighted exposure to PM25.

Population size N_d

Destination factors predict welfare

$\hat{\gamma} < 1$: # draws increase less than one-for-one with destination size.

Stable estimate $\hat{\gamma} = 0.48$: Unprojected estimates $\hat{\delta}_d - \hat{\gamma} \log N_d$ robust.

	(1) GDP	(2) λ.1se	(3) λ.min	(4) All
Log(Population)	0.484^c	0.478^c	0.488^c	0.485^c
	(0.038)	(0.064)	(0.065)	(0.065)
Log(GDP per capita)	0.492^c	0.376^c	0.351^c	0.483^c
	(0.044)	(0.118)	(0.121)	(0.178)
Gini coefficient		−4.306^c	−4.297^c	−5.129^c
		(1.374)	(1.375)	(1.543)
Public share of health exp.		2.306^c	2.302^c	2.298^b
		(0.866)	(0.866)	(0.874)
Control of corruption		−0.074	−0.104	0.054
		(0.214)	(0.217)	(0.427)
Log(Mean work hours)		−1.418	−1.126	−1.040
		(1.056)	(1.099)	(1.108)
Log(PM25)			−0.213	−0.278
			(0.223)	(0.234)
Contractibility				−0.198
				(0.415)
Infant mortality				0.253
				(0.265)
Observations	174	85	85	85
Adjusted R^2	0.589	0.637	0.637	0.634

Second-stage estimates. Standard errors in parentheses. ^{a}—$p < 0.10$; ^{b}—$p < 0.05$; ^{c}—$p < 0.01$.

Destination factors predict welfare

GDP is strong predictor of welfare.

	(1) GDP	(2) λ.1se	(3) λ.min	(4) All
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Destination factors predict welfare

Income, safety net, control of corruption, leisure predict higher welfare.

Inequality, pollution predict lower welfare.

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Destination factors predict welfare

We use lasso to improve our predictions.

λ.1se: Most parsimonious model selected by lasso within 1 s.e. of the minimum RMSE.

Interpretation: Conditioned on included factors, others do not improve predictions of welfare.

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Welfare estimates

Welfare rankings of largest countries

Baseline estimates
1. Norway
2. Luxembourg
6. USA
39. Mexico
69. Brazil
85. India
97. China
172. Haiti

	(1) lambda.1se	l		(4) rojected	(5) GDP per capita	(6) Jones Klenow	(7) Cantril ladder
1	United Kingdom			ed States	United States	United States	Canada
2	Italy			Italy	United Kingdom	France	United States
3	Canada	U		anada	Japan	United Kingdom	Spain
4	United States			Spain	Canada	Japan	United Kingdom
5	Germany			Africa	France	Canada	France
6	Japan			rmany	Germany	Italy	Italy
7	S. Korea	Un		Kingdom	Italy	Spain	Mexico
8	France			rance	Spain	Germany	Germany
9	Mexico			ussia	S. Korea	S. Korea	Brazil
10	Spain			oland	Poland	Poland	Japan
11	Poland			apan	Mexico	Mexico	Argentina
12	Turkey			kraine	Turkey	Turkey	Colombia
13	Thailand			ailand	Russia	Argentina	Thailand
14	Indonesia			urkey	S. Africa	Russia	Poland
15	Brazil			enya	Argentina	Iran	S. Korea
16	S. Africa			igeria	Brazil	Ukraine	Pakistan
17	Russia			Iran	Colombia	Brazil	Egypt
18	Argentina			Egypt	Iran	Thailand	Vietnam
19	India			thiopia	Thailand	Colombia	Iran
20	Ukraine	Thailand	Philippines	S. Korea	Morocco	Egypt	Turkey
21	Iran	Argentina	S. Africa	Colombia	Ukraine	China	India
22	China	Ukraine	Pakistan	Tanzania	China	Indonesia	S. Africa
23	Morocco	Pakistan	India	Argentina	Indonesia	Morocco	Russia
24	Philippines	Egypt	Bangladesh	Morocco	Philippines	Philippines	Morocco
25	Colombia	Morocco	Tanzania	Brazil	Egypt	S. Africa	Ukraine
26	Tanzania	Vietnam	Vietnam	China	Nigeria	Pakistan	Indonesia
27	Pakistan	Kenya	Nigeria	Vietnam	Pakistan	Vietnam	Philippines
28	Bangladesh	Indonesia	Kenya	India	India	India	Nigeria
29	Egypt	Nigeria	Ethiopia	Mexico	Vietnam	Bangladesh	China
30	Nigeria	Bangladesh	Indonesia	Philippines	Kenya	Nigeria	Bangladesh
31	Kenya	Ethiopia	Ukraine	Pakistan	Bangladesh	Kenya	Kenya
32	Vietnam	India	Egypt	Indonesia	Tanzania	Tanzania	Ethiopia
33	Ethiopia	Tanzania	Morocco	Bangladesh	Ethiopia	Ethiopia	Tanzania

These are welfare rankings for large countries with more than 30 million residents. Algeria, Myanmar and Sudan are omitted due to missing values in the Cantril ladder measure. Country names are colored according to region. Red—Africa; Orange—Americas; Green—Asia; Blue—Europe.

Welfare rankings of largest countries

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2	Italy	France	Japan	Italy	United Kingdom	France	United States
3	Canada	United States	United States	Canada	Spain	Spain	Spain
4	United States	Germany	Canada	Spain	S. Africa	Germany	United Kingdom
5	Germany	Canada	United Kingdom	Germany	Germany	Japan	France
6	Japan	Japan	Poland	United Kingdom	France	Italy	Italy
7	S. Korea	United Kingdom	Germany	France	Russia	S. Korea	Mexico
8	France	S. Korea	Italy	Russia	Poland	Mexico	Germany
9	Mexico	Mexico	S. Korea	Poland	Japan	Poland	Brazil
10	Spain	Spain	Spain	Japan	Ukraine	Ukraine	Japan
11	Poland	Russia	Turkey	Ukraine	Thailand	Russia	Argentina
12	Turkey	Poland	China	Thailand	Turkey	Argentina	Colombia
13	Thailand	China	Russia	Turkey	S. Africa	Russia	Thailand
14	Indonesia	Brazil	Argentina	Kenya	Argentina	Iran	Poland
15	Brazil	Turkey	Mexico	Nigeria	Brazil	Ukraine	S. Korea
16	S. Africa	Iran	Colombia	Iran	Colombia	Brazil	Pakistan
17	Russia	Colombia	Brazil	Egypt	Iran	Thailand	Egypt
18	Argentina	Philippines	Thailand	Ethiopia	Thailand	Colombia	Vietnam
19	India	S. Africa	Iran	S. Korea	Morocco	Egypt	Iran
20	Ukraine	Thailand	Philippines	Colombia	Ukraine	China	Turkey
21	Iran	Argentina	S. Africa	Tanzania	China	Indonesia	India
22	China	Ukraine	Pakistan	Argentina	Indonesia	Morocco	S. Africa
23	Morocco	Pakistan	India	Morocco	Philippines	Philippines	Russia
24	Philippines	Egypt	Bangladesh	Brazil	Egypt	S. Africa	Morocco
25	Colombia	Morocco	Tanzania	China	Nigeria	Pakistan	Ukraine
26	Tanzania	Vietnam	Vietnam	Vietnam	Pakistan	Vietnam	Indonesia
27	Pakistan	Kenya	Nigeria	India	India	India	Philippines
28	Bangladesh	Indonesia	Kenya	Mexico	Vietnam	Bangladesh	Nigeria
29	Egypt	Nigeria	Ethiopia	Philippines	Kenya	Nigeria	China
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31	Kenya	Ethiopia	Ukraine	Indonesia	Tanzania	Tanzania	Kenya
32	Vietnam	India	Egypt	Bangladesh	Ethiopia	Ethiopia	Ethiopia
33	Ethiopia	Tanzania	Morocco				Tanzania

Robustness to Z_d ($\rho = 0.8$); South Korea falls from 31st to 44th

These are welfare rankings for large countries with more than 30 million residents. Algeria, Myanmar and Sudan are omitted due to missing values in the Cantril ladder measure. Country names are colored according to region. Red—Africa; Orange—Americas; Green—Asia; Blue—Europe.

Welfare rankings of largest countries

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$\rho = 0.6$; immigrant magnets U.S. and Canada rise

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Welfare rankings of largest countries

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6	Japan	Japan		Germany	Germany	Italy	Italy
7	S. Korea	United Kin		United Kingdom	Italy	Spain	Mexico
8	France	S. Kor		France	Spain	Germany	Germany
9	Mexico	Mexico		Russia	S. Korea	S. Korea	Brazil
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28	Bangladesh	Indonesia	Kenya	India	India	India	Nigeria
29	Egypt	Nigeria	Ethiopia	Mexico	Vietnam	Bangladesh	China
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$\rho = 0.8$–0.9

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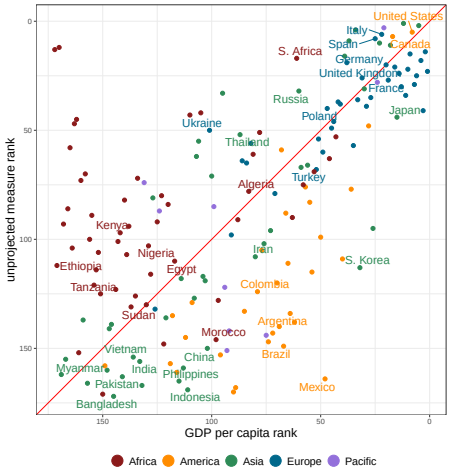
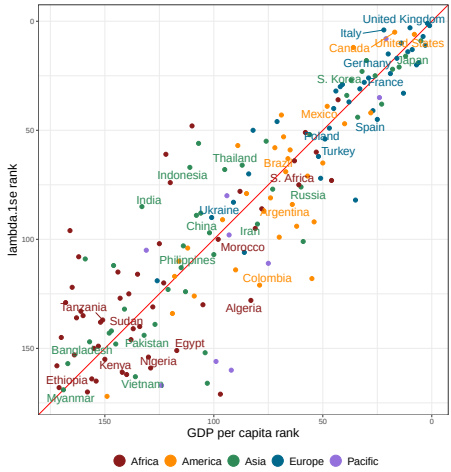
Welfare estimates vs. GDP per capita



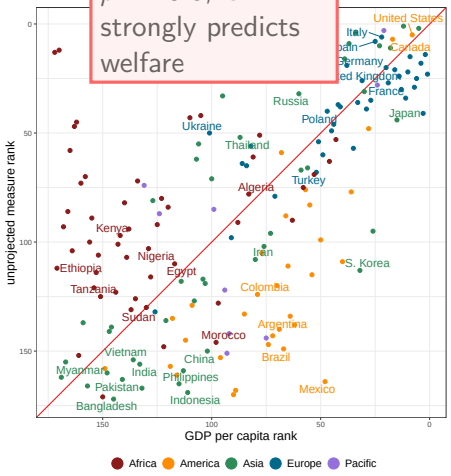
(a) Unprojected vs. GDP per capita



(b) Projected vs. GDP per capita

Welfare estimates vs. GDP per capita

$\rho = 0.6$; GDP strongly predicts welfare



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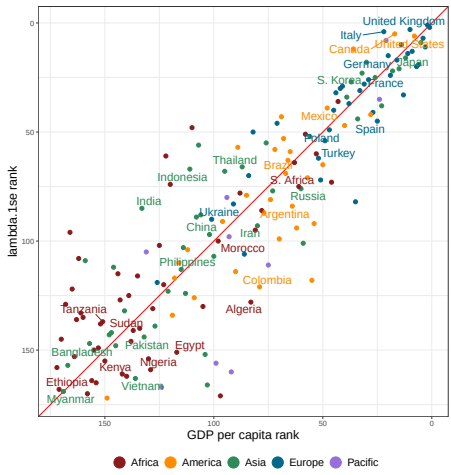
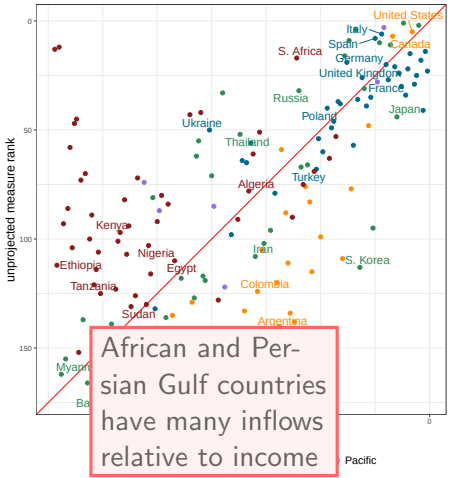


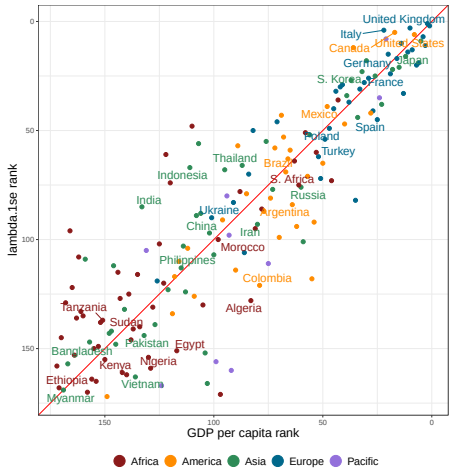
(b) Projected vs. GDP per capita

Welfare estimates vs. GDP per capita



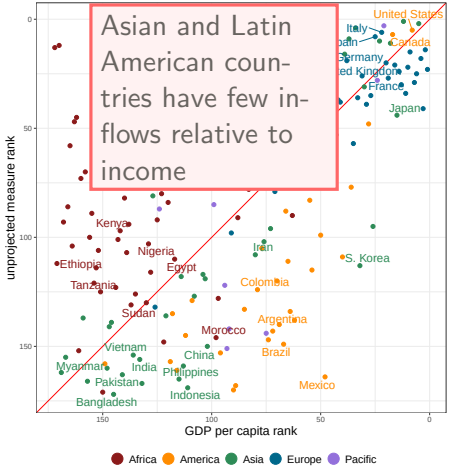
African and Persian Gulf countries have many inflows relative to income

(a) Unprojected vs. GDP per capita

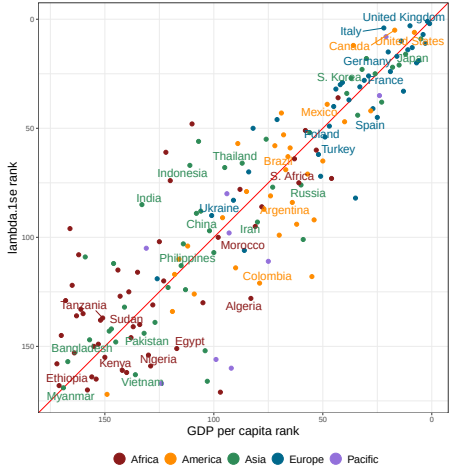


(b) Projected vs. GDP per capita

Welfare estimates vs. GDP per capita

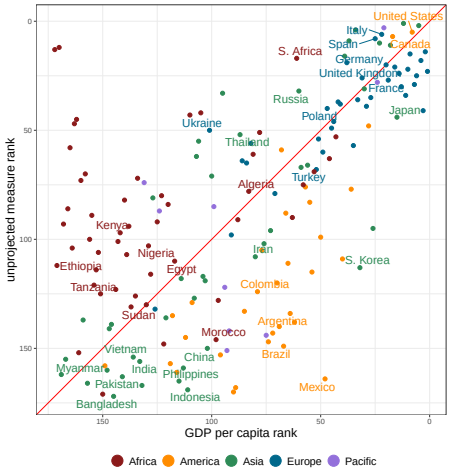


(a) Unprojected vs. GDP per capita

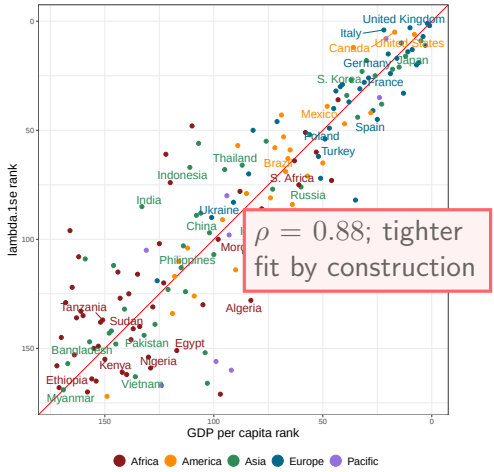


(b) Projected vs. GDP per capita

Welfare estimates vs. GDP per capita

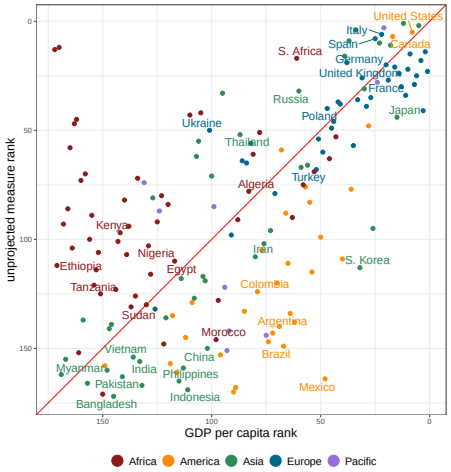


(a) Unprojected vs. GDP per capita

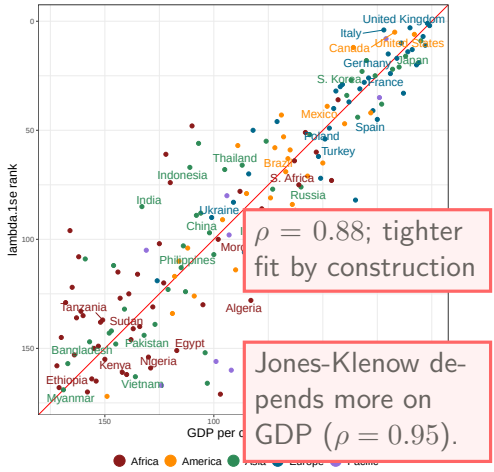


(b) Projected vs. GDP per capita

Welfare estimates vs. GDP per capita



(a) Unprojected vs. GDP per capita



$\rho = 0.88$; tighter fit by construction

Jones-Klenow depends more on GDP ($\rho = 0.95$).

(b) Projected vs. GDP per capita

Conclusions

Contributions

New method for estimating well-being of nations based on revealed preference.

Micro-foundations for gravity in international migration flows.

GDP is a strong predictor of welfare despite its limitations

However, migration flows appear to be responding to factors beyond GDP.

We relax assumptions on how welfare factors enter utility, but impose others on structure of unobserved migration factors and relationship between size, welfare.

Better measures of flows and costs would improve estimates of well-being.

Gravity

Easy to make $m_{o,d} \nearrow$ with N_o and $\searrow$ with $d_{o,d}$. Harder to get $m_{o,d} \nearrow$ with N_d.

$$\begin{aligned} m_{o,d} = N_o \times \pi_{o,d} &= N_o \times \frac{\exp(u_d - \log(d_{o,d}))}{\sum_d \exp(u_d - \log(d_{o,d}))} \\ &= \frac{N_o}{d_{o,d}} \times \frac{\exp(u_d)}{\sum_d \exp(u_d - \log(d_{o,d}))} \end{aligned}$$

In our model, suppose $c_{od} \equiv \log(d_{o,d})$ and $\gamma = 1$. Then:

$$m_{od} = \frac{N_o N_d}{d_{o,d}} \times \frac{\exp(u_d - \xi_d)}{\sum_j N_j \exp(u_j - c_{oj} + \xi_j)}.$$

Correlations