

Predicting Migration in Ireland: a Gravity Model Approach

IFAC Conference 22nd February 2019 Ainhoa Osés Arranz







The opinions expressed and arguments employed in this presentation do not necessarily reflect the official views of IFAC.

This presentation reflects preliminary results on migration prediction, which will not necessarily coincide with those included in the forthcoming IFAC Long-Term Sustainability Report.







Cohort-component demographic model:

$$Pop_t = Pop_{t-1} + B_t - D_t + MgF_t$$

... by age group ... by sex





Gravity Models of Migration





Scope of this paper

- Predict world migration
- Focus on Ireland



Thus far, Predictions through Gravity Models for Ireland specifically have not been developed



Literature: Gravity Models, Prediction



2 main reference papers:

1

• Fernández-Huertas & López-Molina (2018):

"Predicting Spanish Emigration and Immigration"

• Hanson & McIntosh (2011):

"Is the Mediterranean the new Rio Grande? US and EU immigration pressures in the Long Run"



Literature for Ireland



- Net migration as a function of relative wages and relative employment in Ireland and the UK in previous year (model for 1951-1995) (Kearney, 1998)
- Migration increases elasticity of labour supply, allows more rapid growth, and provides insulation to shocks (Kearney & FitzGerald, 1999). In small open economies, migration can amplify business cycles (Lozej, 2018)
- Unclear impact of immigration on domestic wages (Barrett, Bergin & Kelly, 2009)



Official Projections for Ireland



% CSO Net Migration Projections













Foreign stocks in Ireland



Irish stocks abroad





Data: Migration

Cohort-component model:

$$Pop_t = Pop_{t-1} + B_t - D_t + MgF_t$$

$$MgF_{t} \equiv \Delta MgS_{t} \equiv \Delta MgS_{t}^{fg,IRL} - \Delta MgS_{t}^{IRL,fg}$$

Net migration flows in Ireland



Networks

Migration probability increases by stock of co-nationals already living in country of destination \rightarrow lowering of both migration costs (due to information and assimilation difficulties) and visa costs (due to government policies) (Beine et al., 2011)



...Brazilian community already living in Ireland

Brazilian thinking of moving to Ireland...





Foreign

Real GDP per capita

- Historical : Penn World Tables (expenditure-side real GDP at chained PPPs)
- Projected: IMF growth rates to 2023 / OECD long-term forecasts / OBR for UK / CBO for US / 10-year average. If outliers, Oxford Economics forecasts (e.g., India, Latvia)

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Real GNP per capita

- Historical : Real GNP 1960-2011. Growth by Real Domestic GVA thereafter (FitzGerald, 2015).
- Projected : *Budget 2019* forecasts. Gradual growth to potential before stabilising at 2.5%, close to ESRI recovery scenario of MTR

* Problems with using GDP for Ireland. Ideally, we would use real GNI* series, but these are currently unavailable.





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Population

>>> Irish Population

Historical series from CSO. Forecasts from latest CSO Demographic Projections (2018)

>>>> Non-Irish Population



Historical series and forecasts from the United Nations Population Division





- CEPII Database
 - Information on dyads in terms of: common language, geographical distance, etc.
- Country-pair fixed effects for prediction
 - ✓ Multilateral Resistance to Migration (Bertoli & Fernández-Huertas, 2013): migration observed between two countries does not depend solely on their relative attractiveness, but also on the one of alternative destinations.



Migrant stocks, top 5 countries ('000)



Sources: World Bank; and United Nations.



Recent Migration Flows in Ireland

Thousands



Source: CSO



Methodology



Estimation Method



- Gravity models have traditionally been based on log-linearizations
- However, the parameters of log-linearized models estimated by OLS lead to **biased** estimates of the true elasticities (Santos and Tenreyro, 2006)



Estimation Method



• Addressed through...

Poisson Pseudo-Maximum Likelihood

- ... non-linear model
- ... robust method to heteroskedasticity patterns; provides a natural way to deal with zeros in data (Santos and Tenreyro, 2006)





where: o = 1, ..., 231; d = 1, ..., 231; t = 1970, 1980, ..., 2010



Estimation including time-invariant inputs

Dep Var: Migration flows	(1)	(2)	(3)	(4)
Network		0.46***	0.52***	0.97***
		(0.08)	(0.06)	(0.17)
Network, squared		0.01	0.00	-0.01
	0 50 ***	(0.00)	(0.00)	(0.01)
GDP per capita, origin	-0.52	-0.19***		-0.16
CDD par conita destinction	(0.07)	(0.06)		(0.04)
GDP per capita, destination	0.00	0.15		0.34
Population >65 origin	1 09***	-0.01	-0.03	(0.07)
	(0.22)	(0.12)	(0.12)	
Population >65 destination	-0.21	-0 47***	-0.47***	
	(0.18)	(0.13)	(0.09)	
Population 15-64, origin	-1.11*	-0.11	-0.60**	
	(0.61)	(0.34)	(0.26)	
Population 15-64,		× ,	, , , , , , , , , , , , , , , , , , ,	
destination	0.86**	1.32***	1.52***	
	(0.42)	(0.37)	(0.21)	
Population <15, origin	0.50	0.27	0.79***	
	(0.43)	(0.26)	(0.17)	
Population <15, destination	-0.04	-0.59**	-0.83***	
•	(0.25)	(0.22)	(0.15)	0.40
Common language	1.44***	0.24**	0.26**	0.12
	(0.11)	(0.12)	(0.09)	(0.10)
Distance	-0.0003***	-0.0001 ***	-0.0001 ***	-0.00004***
	(0.00)	(0.00)	(0.00)	(0.00)
Observations	37,542	30,883	42,543	30,883



Note: Robust standard errors in brackets



Prediction: models & results

	Baseline					
	Dep Var: Migration flows	(1)	(2)	(3)	(4)	
Endogenous	Network		0.61***	0.65***	0.54***	
in forecasts	Network, sq.		-0.04***	-0.04***	-0.02	
	GDP per capita, origin	-0.27*	-0.26*	(0.01)	0.13	
		(0.15)	(0.14)		(0.15)	
	GDP per capita, destination	0.39***	0.44*** (0.12)		0.40***	
	Population >65, origin	0.11	0.19	0.36 (0.56)		
	Population >65, destination	0.06	-0.13	-0.40		
	Population 15-64, origin	-0.04 (0.61)	0.49 (0.74)	0.12 (0.77)		
	Population 15-64, destination	1.69***	1.81*** (0.68)	1.81 *** (0.61)		
	Population <15, origin	0.62 (0.43)	0.43 (0.44)	0.99***		
	Population <15, destination	-0.99** (0.45)	-0.96** (0.45)	-1.14*** (0.36)		
	Country-pair fixed effects Observations	Yes 32,893	Yes 26,984	Yes 39,545	Yes 26,984	

Note: Robust standard errors in brackets

Irish Fiscal Advisory Council



Model projections: annual flows, average ('000)



Sources: CSO; and own predictions based on model 2



Model projections: annual flows, average ('000)





Sources: World Bank; United Nations; own predictions based on model 2



Model projections: UK-IRL annual flows, average ('000)



Sources: World Bank; United Nations; own predictions based on model 2



Alternative growth scenarios



Alternative scenarios: Irish GNP





Model projections: annual net flows, average ('000s)



Sources: World Bank; United Nations; own model predictions



Net migration change (2020-2050)





Conclusions



Conclusions

- First gravity model to predict migration in Ireland
 - Findings consistent with international literature
- Model projections suggest positive flows over the whole projection horizon
 - Foreign flows to Ireland consistently strong
 - Outweighing flows of Irish abroad
- Next steps
 - Higher frequency of predictions (now 10 year);
 - Use predictions in long-term sustainability work





Thanks for your attention!



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