



# Modelling Trade Policy Scenarios: Macroeconomic and Trade Effects of Restrictions in Cross Border Labour Mobility

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## Outline

- Introduction and motivation for the analysis.
- Modelling approach - motivation for using two different frameworks to quantify the scenario.
- Selection of countries and regions used in the scenario.
- Constructing the calibration, data sources and bringing the data to the models.
- Scenario results and conclusions.

## Introduction

- Explore the potential economic impact of long-term frictions on international mobility of labour at both the sectoral and macroeconomic level.
- COVID-19 has focused renewed attention on the economic issues around cross border mobility of labour.
- Just as production in the global economy relies on significant and complex international flows of intermediate and final goods and services in global supply chains, it is also shaped by complex cross border flows of labour.

## » COVID-19 and mobility

- Following the pandemic, almost all OECD countries have restricted admissions to foreign nationals.
- Mobility indicator: issuance of new visas and permits collapsed by 46% in the first half of 2020 relative to the same period in 2019. The largest drop on record.
- Labour Supply: The new reality resulting from the pandemic is likely to discourage migration - all three classic migration costs identified for example by Borjas (1999), could increase:
  - Direct costs to transportation of goods and people;
  - Foregone earnings from unemployment during a potentially longer transition between markets;
  - Psychological costs from leaving family and social networks due to difficulty in travelling back to a home country and increased difficulty integrating due to social distancing rules.

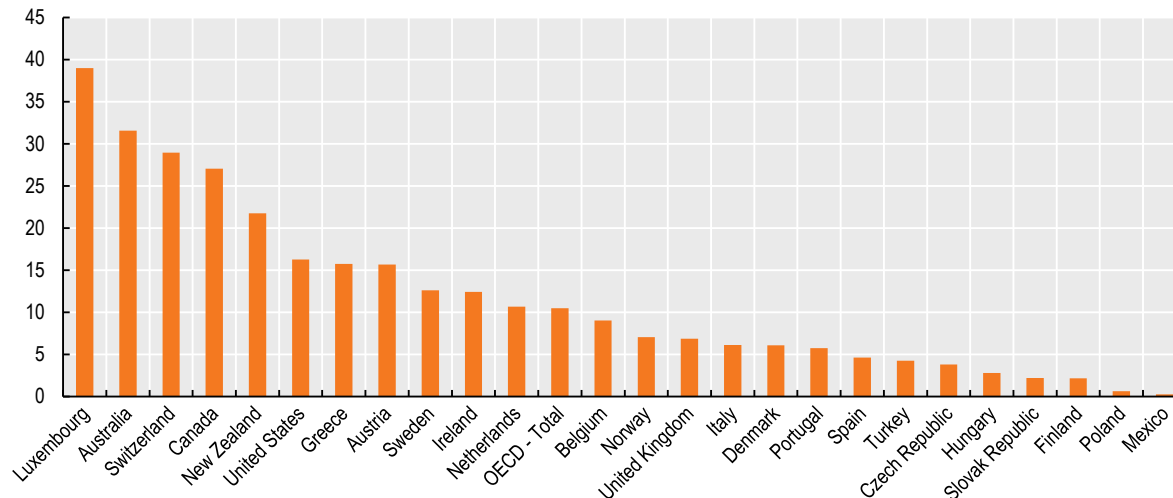
## » Introduction: The scenario

- Mobility has many economic and social implications.
- One dimension of mobility: how a long-term decrease in cross border mobility could alter net migration flows and thus:
  - The supply of labour in internationally integrated economies.
  - Potential consequences for patterns of production and trade.
- A stylised 20% decline in long-term net migration which is converted to a labour supply change.
- The shock is necessarily stylised due to the uncertainty surrounding the long-term impact of the pandemic on mobility.
- Approximately equal to half the change in flows seen in some recent real world examples of substantial changes in mobility frictions,
  - Example the increase in immigration in the five years following the 2004 enlargement of the European Union.

## Foreign-born workers account for significant shares of the population and labour supply in OECD countries

- While 9% of the population in employment were foreign-born in European OECD countries in 2005, that share reached 14% in 2018. The corresponding shares were 16% and 18%, respectively, in the United States and 26% and 30% in Australia

*Foreign-born workforce in manufacturing, % of total*



## » Approach to quantification and related studies

- The analysis focusses on the trade and wider economic impact in a general equilibrium setting (Smith and Thoenissen 2019).
- In general, the macroeconomic consequences of migration, and in particular the general equilibrium consequences are less well understood and much less studied.
  - Requires globally consistent data. Flows must add up.
- Seasonal workers in agriculture and other short term migrants.
  - The modelling abstracts from these important – but so far scarcely documented – differences and instead focuses on potential effects of decreased cross border mobility on long-term migration.
- A benefit of a more general scenario is that it allows an illustration of the potential overall long-term changes in output and global trade patterns.

## » The modelling of migration is typically stylised using calibrated shocks.

- OECD (2016) analysis of the long-term impacts of Brexit employed three migration scenarios.
  - NiGEM macroeconomic model with an optimistic, central and pessimistic scenario with a cut in net migration of 23%, 34% and 67%.
- IMF (2020) projections for future global net migration flows as a function of, geographical and cultural barriers, conflicts and climate change.
- Deutsche Bundesbank (2017) study the 2015 refugee influx into Germany.
  - Assumption that refugees equal in number to 1% of the native German population migrate to Germany and stay long-term.
- The analysis complements this literature by presenting a similarly stylised shock to mobility which is:
  - Global, calibrated for individual countries and regions,
  - Uses the latest international migration statistics and is
  - Differentiated by occupation and skill type.
- Capture highly differentiated impacts at the sector level that subsequently translate into potential trade impacts.



## » Using two models to quantify the scenario

- A long-term decline in labour mobility affecting labour supply is a scenario where the strengths of two different modelling approaches can be combined to provide a more comprehensive economic impact assessment.
- This approach was taken in OECD (2016) “Brexit: A taxing Decision”.

### METRO CGE model:

- The OECD’s trade model, METRO, is a computable general equilibrium (CGE) model that uses data to explore the economic impact of changes in policy, technology and other factors.
- METRO tracks the myriad ways multiple economies are connected, how production and trade are linked in global value chains, e.g. intermediate and final goods, and how resources such as labour, capital and natural resources are allocated across all economic activities.
- METRO has been most recently used to explore a series of illustrative scenarios designed to examine issues in the trade policy debate.

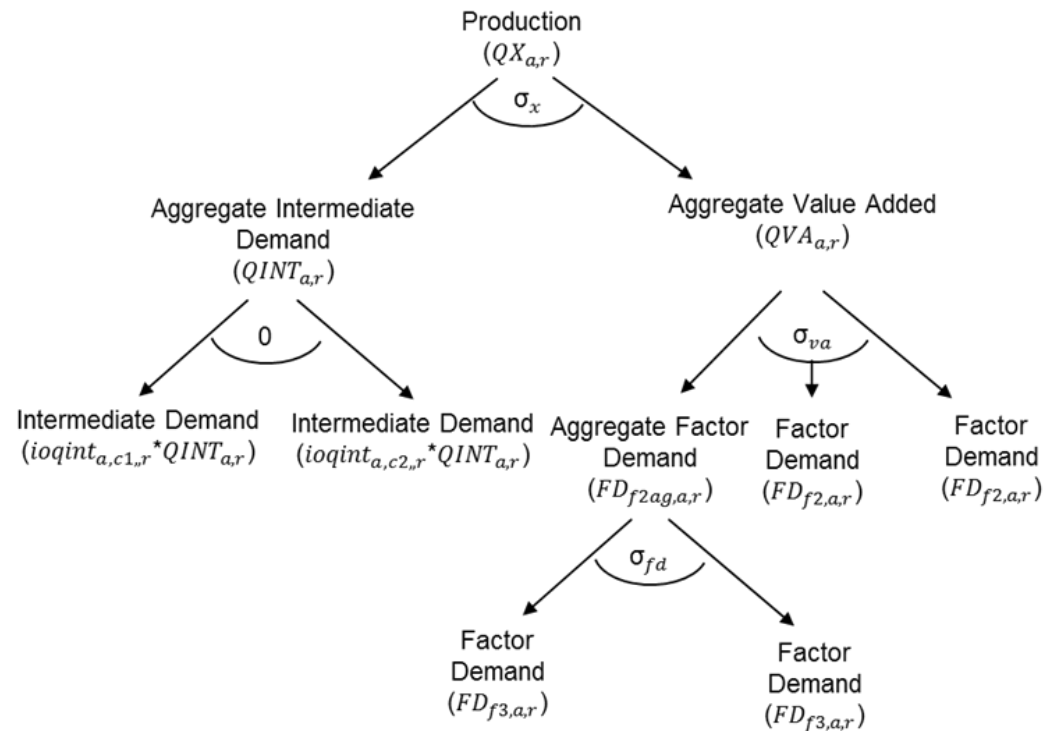
## Mobility scenario in METRO

- The detail and micro foundation of METRO is well suited to provide insights in to the drivers and outcomes of the reallocation of resources and its effects at the sectoral level.
- The full METRO database contains 65 countries and regional aggregates, 65 commodities and eight production factors.
- A restriction on labour mobility can be implemented in METRO at the sectoral level taking into account the proportion of mobile labour in each of five skill categories in each sector.
- Technical and assistant professionals, Clerks, Service and shop assistants, Office managers and professionals, Agricultural and other low-skilled workers.

## Each METRO sector demands labour by skill category – no domestic and foreign distinction

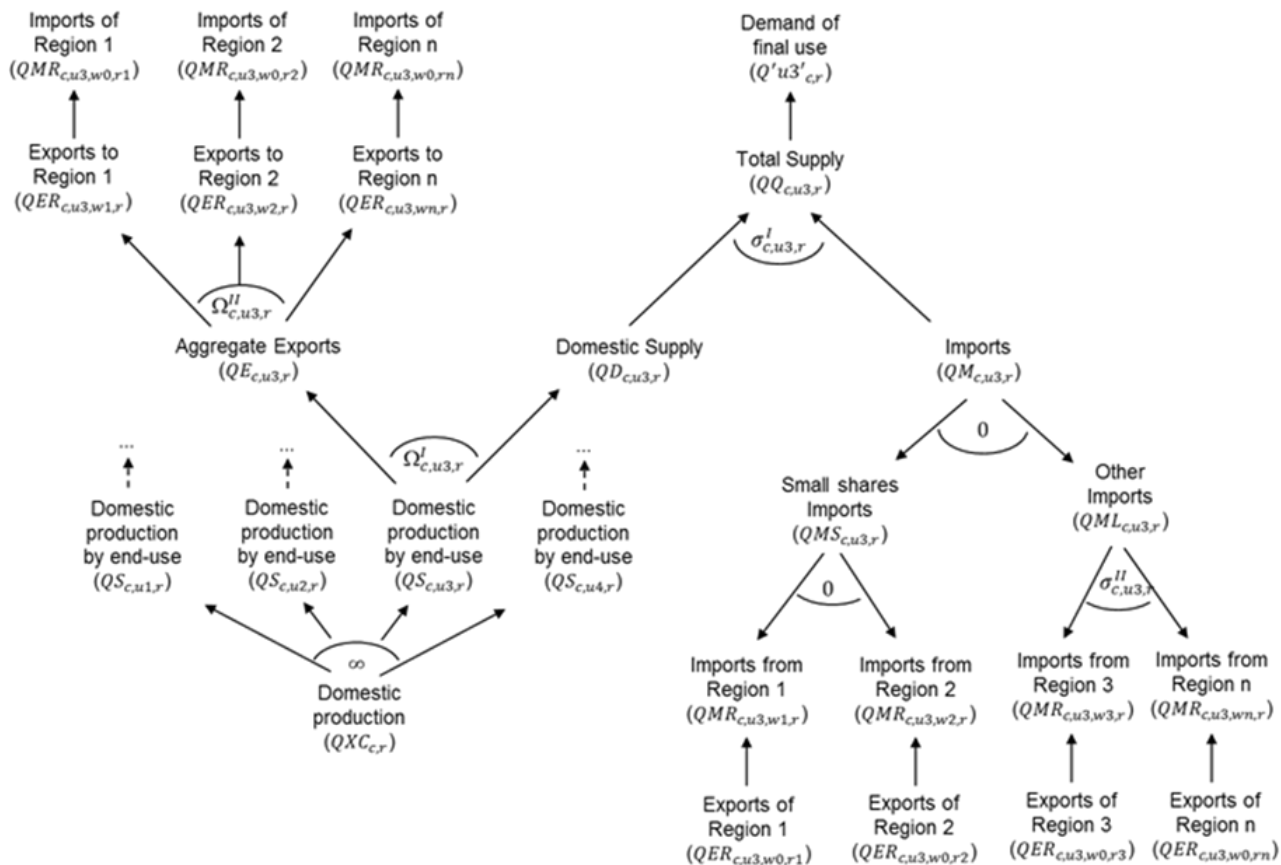
Agriculture  
 Natural resources  
 Food and beverage  
 Textile and wearing apparel  
 Other manufacturing  
 Pharmaceuticals Chemicals  
 Mineral and metal products  
 Electronic equipment  
 Machinery and equipment  
 Motor vehicles and parts  
 Trade and storage  
 Hospitality  
 Transport services  
 Construction  
 Financial services and insurance  
 Business services  
 Other services  
 Education

Source: OECD METRO documentation



# METRO: Structure of commodity market by use

Stylised calibration but considerable detail on the model side.



Source: OECD METRO documentation

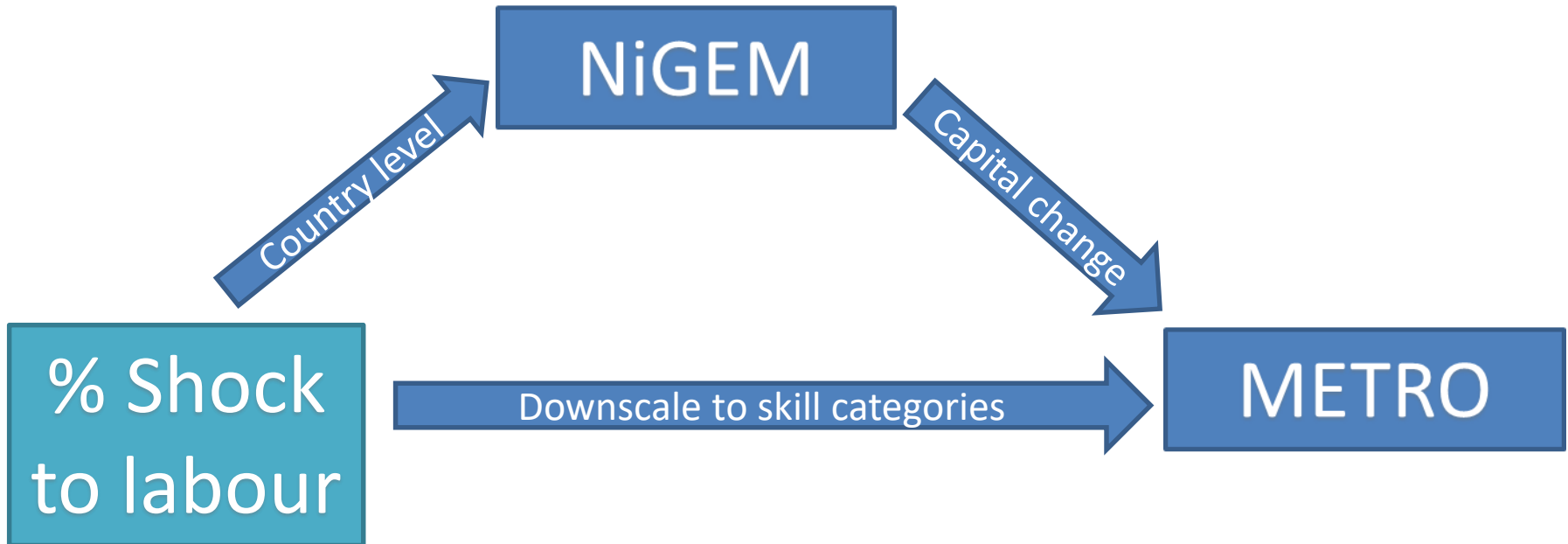
## METRO DATA

- Uses the Global Trade Analysis Project (GTAP) database.
- GTAP publicly available (newest with fee) global database containing complete bilateral trade information, transport and protection linkages.
- The GTAP Data Base is a consistent representation of the world economy for a pre-determined reference year.
- Several data sources: national input-output (I-O) tables, trade, macroeconomic, energy and protection data.
- The underlying input-output tables are heterogeneous in sources, methodology, base years, and sectoral detail, to achieve consistency, efforts are made to make sources comparable.
- The objective is to facilitate the operation of economic simulation models.
- Also uniquely incorporates recent OECD statistical developments in non-tariff measures, services trade and trade in value added (TiVA).

## » Combining METRO and a macroeconomic model

- In METRO, simulations typically represent medium-term adjustments to shocks, under an assumption that production factors are mobile across sectors, but there is no capital accumulation.
- From a macroeconomic perspective, given the scale of reliance on foreign-born labour, if lower international mobility persists there are potentially large macroeconomic consequences with a response in capital accumulation.
- For this shock capital is an important channel.
- To run a scenario with a long-term horizon capital should adjust.
- The capital adjustments from a macroeconomic model can be used to calibrate METRO.
- Conceptually extend the METRO horizon and take into account an important mechanism in this type of scenario.

## Combining the models



## » The NiGEM macroeconomic model

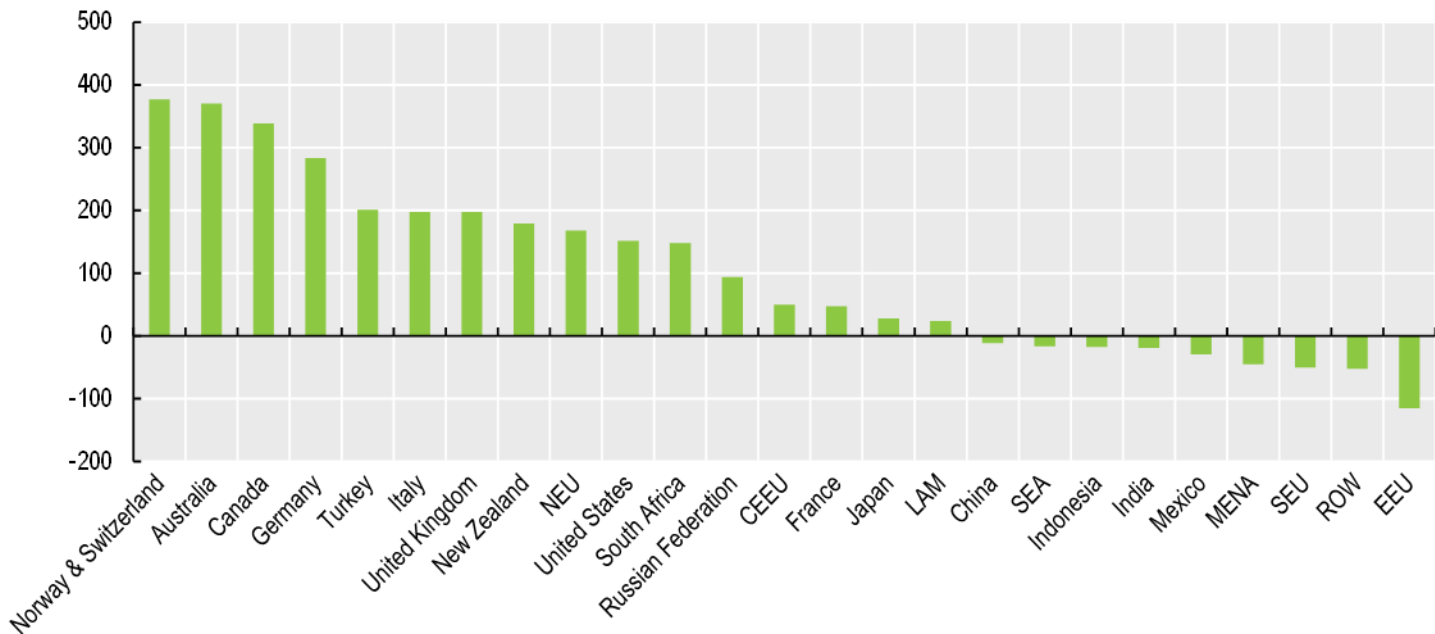
- Global quarterly economic model covering 60 countries and regions. 5,000 macro variables.
- Large scale model with error-correction equilibrium around stocks of capital and labour.
- Use: evaluate the impact of economic shocks and alternative scenarios.
- Detailed modelling of the dynamics of the capital stock. Housing, business and government. Includes a monetary policy reaction.
- Important as a shock to labour will result in adjustments to capital. Shock will change important variables.
- The advantage of NiGEM for the applied scenario is that macro relationships for a large number of economies, at considerable detail, are already specified and the model can easily be aggregated to fit the country detail used in METRO.



## Model aggregation

- METRO is calibrated for this analysis to 18 economies and regions, 26 sectors.
- CEEU (Czech Republic, Hungary, Slovakia, Slovenia), EEU (Bulgaria, Estonia, Latvia, Lithuania, Poland, Romania). Similar long-term patterns of net-migration.

*Net migration per 100,000 of total population, average over 10 years to 2020*



## Calibrating the international labour mobility shock

- Mobility shock is proxied through an assumed percentage reduction of bilateral net-migration flows.
- This proxy is used to give the scenario a grounding in current average levels of mobility globally.
- The scenario is not a model of migration and does not attempt capture all the complexities of flows.
- Shock is stylised as it was not possible to provide an evidence based number for the disruptions related to the pandemic.
- The calibration does not capture very short-run and potentially acute seasonal movements of labour. Long-run in nature.

## » Data for the shock

- The starting point for the calculation of the shock is average bilateral net migration over the past ten years in each economy and region.
- As METRO and the macro model are both global models datasets with global coverage are needed.
- United Nations World Population Prospects.
- Abel, G. and J. Cohen (2019), “Bilateral international migration flow estimates for 200 countries”, Scientific Data.
  - Many countries do not publish data on bilateral migration flows.
- Bilateral detail needed to fit the data to the models and create a matrix of bilateral flows. Aligns with UN data.

## Flows data

- Updated flows data gives a different picture to stock based measures.

*Share of migrants into the UK by country of origin 2015-2020, per cent*

	Flow		Stock
India	9.4	India	9.3
Romania	6.8	Poland	7.9
Australia	6.3	Pakistan	5.9
Pakistan	5.4	Ireland	5.9
Bangladesh	4.9	Germany	3.6
USA	4.2	Romania	3.6
Spain	3.6	Italy	2.7
Germany	3.3	Bangladesh	2.7
Italy	3.2	South Africa	2.5
Poland	2.9	USA	2.2
Zimbabwe	2.8	Nigeria	2.1
Canada	2.6	China	2.0
France	2.3	Kenya	1.8
Ireland	2.2	Jamaica	1.8
China	2.1	Lithuania	1.7

## » Bilateral flows data

- Net migration and total population are taken as an average over ten years ending in 2020.
- Any increase or decrease in flows is allocated to source and destination economy. Globally the movements sum to zero. Rows sum to 1.
- More detail than an aggregate shock.

	AUS	CAN	CEEU	CHN	DEU	EEA	EEU	.	.	n
AUS	0				0					
CAN		0			0.02					
CEEU			0		0					
CHN				0	0					
DEU	0.01	0	0.02	0.02	0	0	0.14			
EEA					0.15	0				
EEU					0		0			
.								0		
.									0	
n										0

## » Adjusting flows for the labour market

- Not all migrants will enter the labour market.
- Migrant employment rates have considerable variation: New Zealand (80%), France (67%), Turkey (51%). Source: OECD Migration Outlook.
- The proportion of migrants in the 15-64 age bracket varies across OECD countries. Italy (88% ), Australia (75%), Mexico (41%). Source: 2019 UN International Migrant Stock data.
- Total employment is taken from the International Labour Organization (ILO) database, Employment by Sex and Age – ILO Modelled Estimates.

## » Downscaling to METRO

- Global Bilateral Migration Data Base, the GMig2 Data (2014) based on the GTAP 10 Data used for METRO (Walmsley, Aguiar and Parsons, 2021).
- Quantifies the proportion of migrant labour (defined as foreign born) in each skill category in each economy.
- The reduction is thus differentiated by skill category and economy and this manifests itself in a heterogeneity at the sector level.
- Assumptions:
  - Abstracts from the dynamics of mobile workers transitioning between skill categories over time as they become more established in host economies.
  - Rules out feedbacks where a movement of workers may impact on labour market conditions and these in turn change the size or direction of mobility flows.

## » Adding the capital change

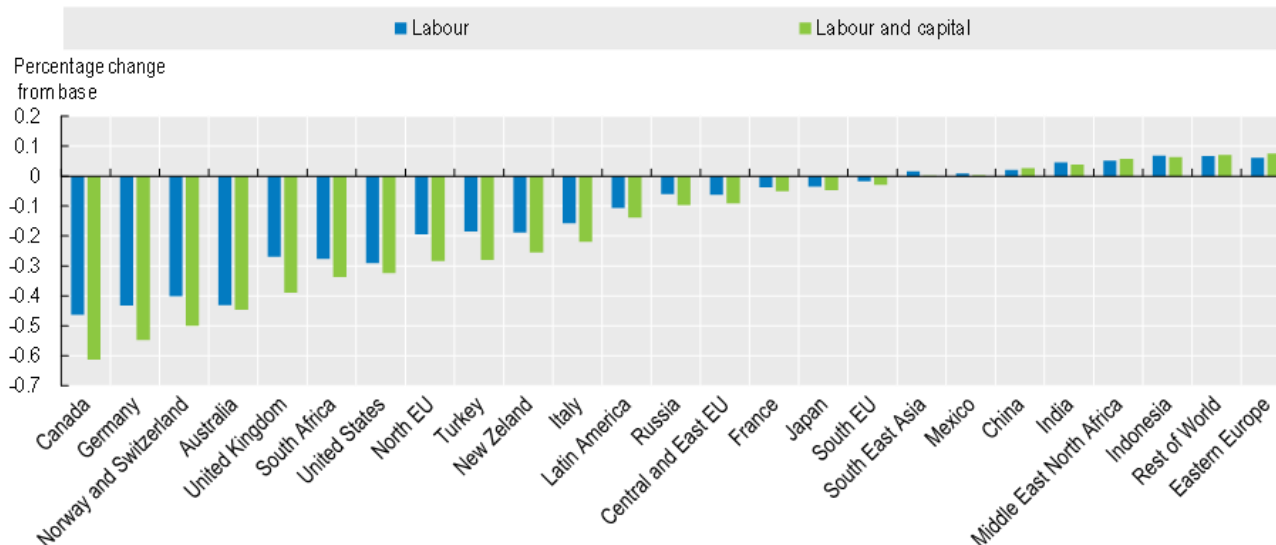
- To determine capital stock changes, the same mobility shock is simulated in NiGEM as in METRO.
- NiGEM does not contain the same detail of skill categories as METRO and so the shock is applied to the total population.
- NiGEM is dynamic so change is applied gradually and accumulates to the calibrated shock after ten years.
- The capital stock changes resulting for the NiGEM simulation are aggregated into METRO regions and translated into a capital stock shock.
- Guides the capital change in the METRO calibration.



## » Results - Macro

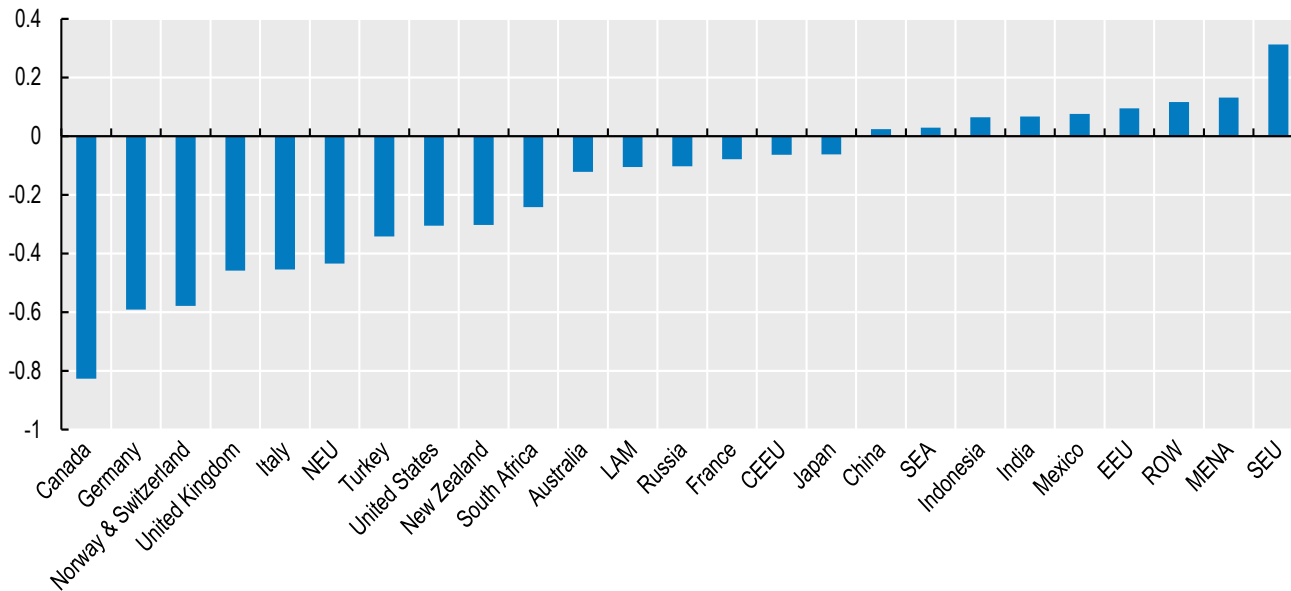
- OECD economies would suffer most economically. The shock shifts some economic activity away from OECD to non-OECD economies.
- The decline in mobility translates into a reduction in labour supply. This increases wages and undermines competitiveness.

### *GDP impact of a reduction in labour mobility through labour and capital*



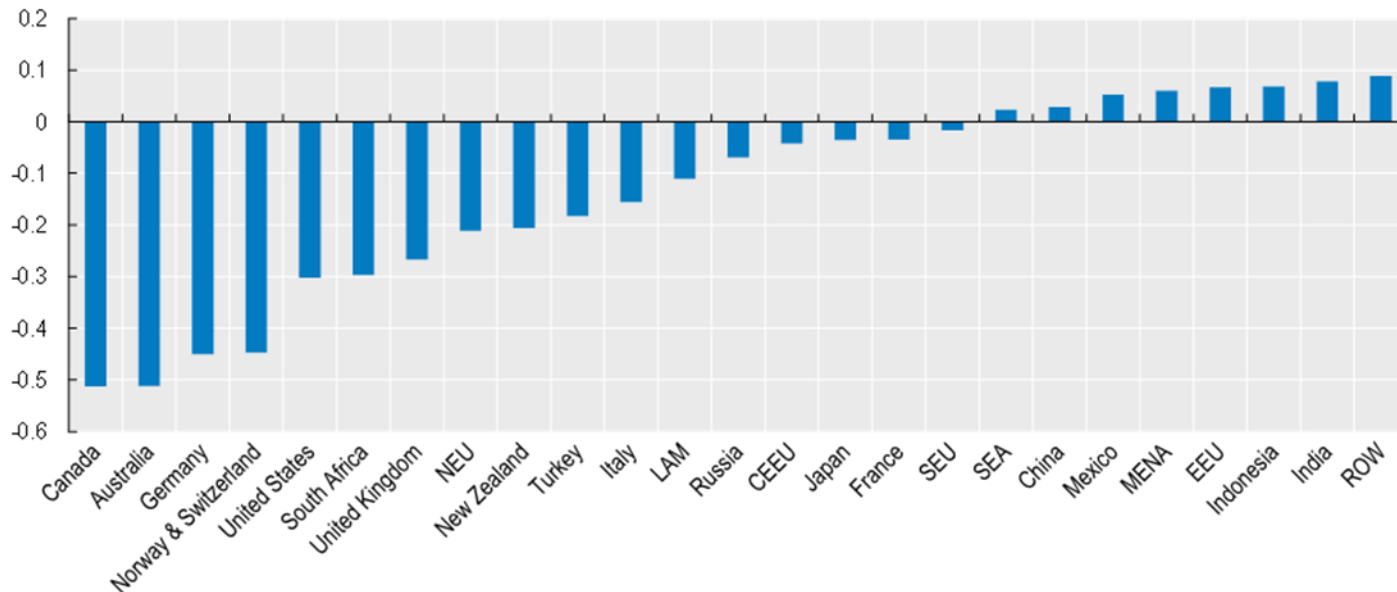
## Investment fall in NiGEM

*Average % change from base in private sector investment after 10 years*



## Investment fall in METRO

*Average % change from base in investment*

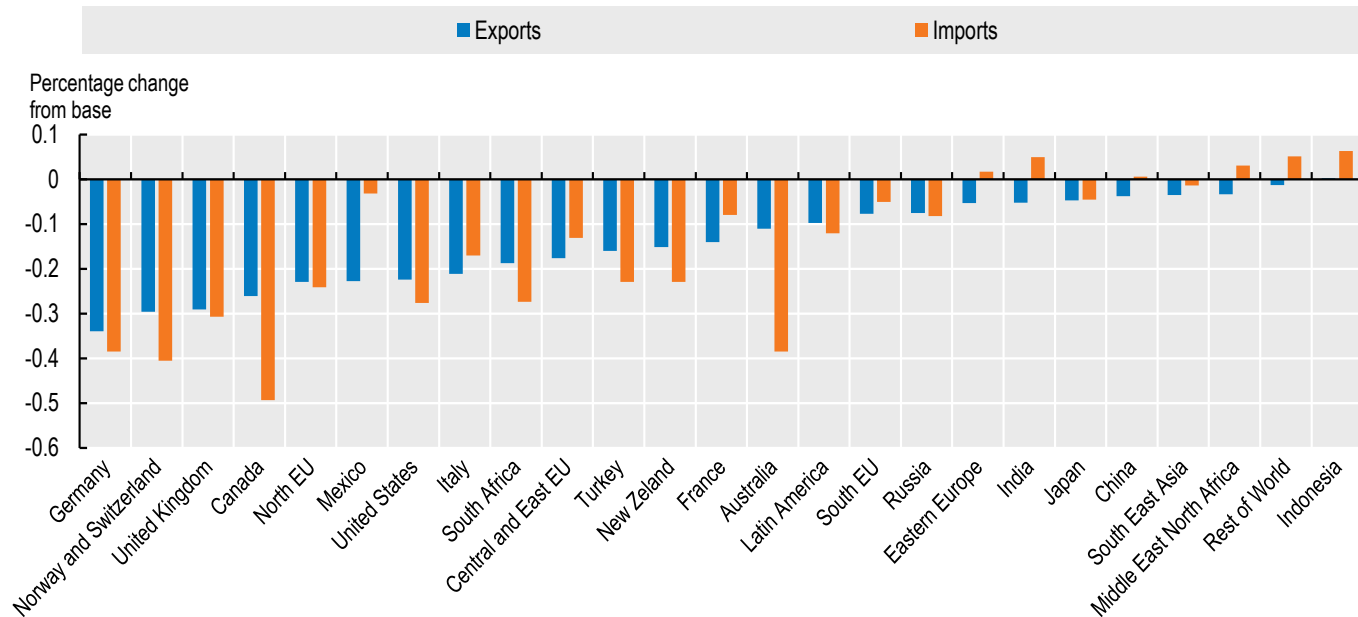


## » Results: Investment and capital stock impact in the macro model

- Mobility reduction results in an increase of wages across the economies which are net recipients of mobile labour and a fall in wages in economies which are net senders.
- The labour force contraction and the rise in wages suppress output. Increased wage rates contribute to a rise in inflation.
- Firms respond to rising wage costs by reducing employment.
- The fall in employment and rising inflation leads to a fall in exports and consumption. Firms react by cutting back on investment.
- Central banks cut the interest rate and this stimulates consumption.
- Over the longer-term, the reduction in labour impacts the economy's potential output.
- In highly impacted economies: Australia, Germany and Canada the fall in potential output ranges from 0.4% to 0.6%.
  - Leads to a long-term reduction in the capital stock.
  - Changes ranking of impact.

## Imports and exports

### *Response of exports and imports to a long-term reduction in mobility*



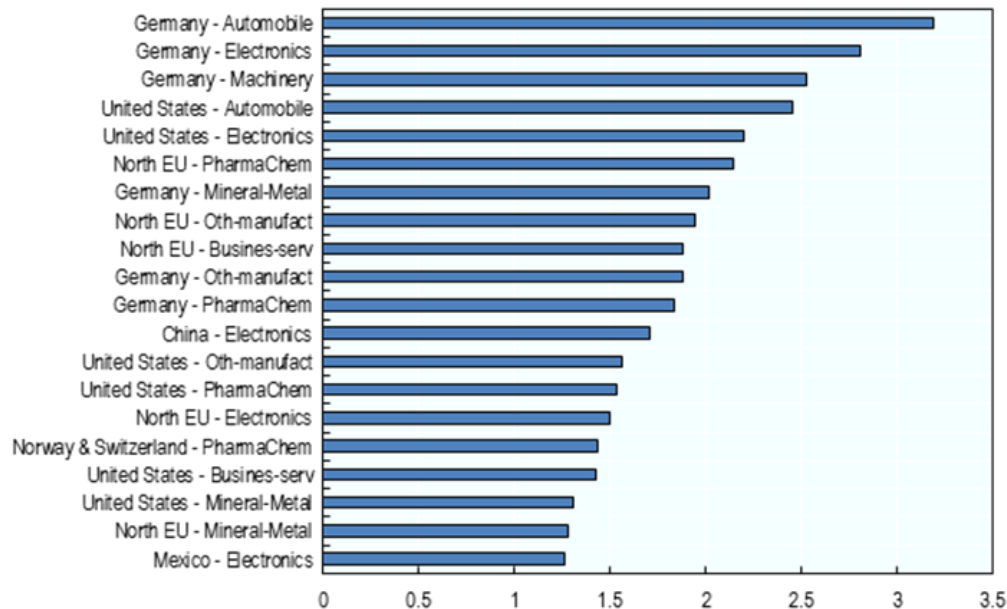
## » Changes driven by different factors

- Imports depend on consumption which in turn depends on household income. The steepest declines in imports occur in the economies with the largest reductions in the labour force.
- The distribution of the shock by labour skill category also impacts the decline. In Canada, for example, there are larger declines in the higher earning categories as to Germany.
- Exports depend on competitiveness and external demand.
- The importance of external demand is illustrated by the results for Canada and Australia. Both experience a comparatively large reduction in mobility flows but the export decline in Australia is dampened by the fact that its largest export markets, China and Japan, either grow or have a comparatively small reduction in GDP.
- Canadas main export market, the United States experiences a relatively large contraction in GDP.

## Results – Sectoral

- Labour intensive manufacturing activities in OECD economies would experience the greatest contractions in exports of all sectors globally, with automobiles, electronics and pharmaceuticals among the most affected.

*Global realignment: Export impact ranking of manufacturing and service sectors*



## » Sectoral impact

- The wage rise is stronger in economies with a higher concentration of foreign-born labour and historically larger inflows.
- In the scenario, in some sectors, the wage rises seen in Germany are double those in France.
- The comparative advantage mechanism stemming from sectoral factor intensities and economy factor endowments can be shown by the distribution of sectoral value added impacts.
- Economies are ranked by the size of the labour shock (from positive to negative) and sectors are sorted by average rank in capital labour ratio.



## Effects of the mobility shock by sector according to sectors' labour intensity

	Textile and wearing apparel	Machinery and equipment	Motor vehicles and parts	Education	Electronic equipment	Hospitality	Agriculture	Pharmaceuticals	Chemicals	Natural resources	Mineral and metal products	Transport services	Food and beverage	Other manufacturing	Construction	Financial services and insurance	Business services	Trade and storage	Other services	real GDP impact labour&capital
Eastern Europe	0.03%	0.08%	-0.06%	0.12%	-0.06%	0.12%	0.04%	0.00%	-0.03%	0.05%	0.06%	0.09%	0.01%	0.10%	0.10%	0.08%	0.07%	0.11%	0.07%	
Rest of World	0.06%	0.11%	0.11%	0.12%	0.06%	0.11%	0.06%	0.08%	-0.05%	0.09%	0.06%	0.10%	0.08%	0.10%	0.10%	0.10%	0.09%	0.10%	0.07%	
Indonesia	0.02%	0.08%	0.07%	0.12%	0.08%	0.09%	0.02%	0.04%	-0.03%	0.05%	0.06%	0.04%	0.04%	0.08%	0.08%	0.04%	0.07%	0.09%	0.06%	
Middle East North Africa	0.03%	0.13%	0.06%	0.07%	0.05%	0.09%	0.05%	0.01%	-0.06%	0.07%	0.03%	0.08%	0.03%	0.07%	0.07%	0.06%	0.07%	0.07%	0.06%	
India	-0.03%	0.04%	0.07%	0.07%	0.01%	0.14%	0.01%	0.04%	-0.05%	0.05%	0.04%	0.04%	0.01%	0.06%	0.06%	0.05%	0.09%	0.06%	0.04%	
China	-0.02%	0.04%	0.06%	0.04%	-0.01%	0.04%	0.01%	0.02%	-0.02%	0.03%	0.02%	0.03%	0.00%	0.03%	0.03%	0.03%	0.03%	0.03%	0.04%	
Mexico	-0.01%	-0.16%	-0.19%	0.01%	-0.32%	0.08%	0.00%	0.02%	-0.09%	-0.05%	0.05%	0.07%	-0.01%	0.05%	0.03%	0.02%	0.01%	0.04%	0.00%	
South East Asia	-0.08%	0.02%	0.03%	0.02%	-0.03%	0.02%	0.01%	-0.01%	-0.05%	0.02%	-0.03%	0.02%	-0.03%	0.02%	0.01%	0.01%	0.01%	0.01%	0.00%	
South EU	-0.06%	0.01%	-0.12%	-0.04%	-0.04%	-0.02%	-0.04%	-0.09%	-0.14%	-0.03%	-0.06%	-0.02%	-0.05%	-0.03%	-0.02%	-0.03%	-0.02%	-0.03%	-0.03%	
Japan	-0.04%	-0.04%	-0.06%	-0.07%	-0.04%	-0.04%	-0.02%	-0.03%	-0.14%	-0.04%	-0.05%	-0.03%	-0.06%	-0.05%	-0.04%	-0.04%	-0.04%	-0.06%	-0.05%	
France	-0.10%	-0.05%	-0.18%	-0.08%	-0.10%	-0.02%	-0.05%	-0.15%	-0.17%	-0.07%	-0.05%	-0.03%	-0.09%	-0.04%	-0.03%	-0.04%	-0.03%	-0.06%	-0.05%	
Central and East EU	-0.17%	-0.15%	-0.19%	-0.11%	-0.24%	-0.05%	-0.04%	-0.11%	-0.10%	-0.15%	-0.10%	-0.02%	-0.16%	-0.06%	-0.05%	-0.07%	-0.09%	-0.08%	-0.09%	
Russia	-0.15%	-0.14%	-0.10%	-0.18%	-0.07%	-0.07%	0.04%	-0.06%	-0.13%	-0.12%	-0.09%	-0.09%	-0.13%	-0.08%	-0.10%	-0.08%	-0.15%	-0.10%	-0.10%	
Latin America	-0.15%	-0.14%	-0.15%	-0.20%	-0.16%	-0.14%	-0.07%	-0.12%	-0.09%	-0.15%	-0.13%	-0.11%	-0.14%	-0.15%	-0.13%	-0.13%	-0.13%	-0.17%	-0.14%	
Italy	-0.23%	-0.23%	-0.22%	-0.37%	-0.24%	-0.17%	-0.18%	-0.25%	-0.12%	-0.24%	-0.18%	-0.17%	-0.24%	-0.23%	-0.18%	-0.19%	-0.17%	-0.27%	-0.22%	
New Zealand	-0.31%	-0.31%	-0.28%	-0.36%	-0.32%	-0.26%	-0.12%	-0.20%	-0.10%	-0.29%	-0.25%	-0.14%	-0.28%	-0.29%	-0.25%	-0.24%	-0.25%	-0.30%	-0.26%	
Turkey	-0.22%	-0.17%	-0.21%	-0.48%	-0.18%	-0.31%	-0.17%	-0.22%	-0.16%	-0.23%	-0.24%	-0.21%	-0.25%	-0.28%	-0.28%	-0.28%	-0.28%	-0.25%	-0.28%	
North EU	-0.27%	-0.27%	-0.27%	-0.42%	-0.30%	-0.24%	-0.21%	-0.23%	-0.12%	-0.30%	-0.25%	-0.21%	-0.29%	-0.33%	-0.23%	-0.26%	-0.24%	-0.36%	-0.28%	
United States	-0.31%	-0.31%	-0.30%	-0.38%	-0.34%	-0.33%	-0.15%	-0.26%	-0.11%	-0.32%	-0.34%	-0.26%	-0.30%	-0.34%	-0.31%	-0.31%	-0.32%	-0.35%	-0.32%	
South Africa	-0.39%	-0.35%	-0.32%	-0.48%	-0.35%	-0.33%	-0.22%	-0.30%	-0.12%	-0.28%	-0.32%	-0.31%	-0.32%	-0.37%	-0.33%	-0.32%	-0.30%	-0.41%	-0.34%	
United Kingdom	-0.37%	-0.35%	-0.30%	-0.57%	-0.40%	-0.33%	-0.23%	-0.35%	-0.13%	-0.38%	-0.34%	-0.32%	-0.38%	-0.39%	-0.36%	-0.37%	-0.33%	-0.47%	-0.39%	
Australia	-0.47%	-0.52%	-0.52%	-0.61%	-0.57%	-0.50%	-0.22%	-0.37%	-0.07%	-0.38%	-0.47%	-0.41%	-0.48%	-0.56%	-0.44%	-0.46%	-0.47%	-0.51%	-0.45%	
Norway & Switzerland	-0.36%	-0.51%	-0.57%	-0.80%	-0.48%	-0.51%	-0.20%	-0.48%	-0.08%	-0.32%	-0.40%	-0.38%	-0.48%	-0.57%	-0.44%	-0.50%	-0.48%	-0.62%	-0.50%	
Germany	-0.48%	-0.52%	-0.33%	-0.83%	-0.48%	-0.51%	-0.34%	-0.33%	-0.25%	-0.52%	-0.42%	-0.43%	-0.52%	-0.62%	-0.48%	-0.48%	-0.45%	-0.73%	-0.55%	
Canada	-0.59%	-0.51%	-0.42%	-0.92%	-0.60%	-0.55%	-0.25%	-0.42%	-0.13%	-0.46%	-0.53%	-0.48%	-0.51%	-0.69%	-0.55%	-0.60%	-0.54%	-0.81%	-0.61%	
Labour intensity index*	15.84	14.76	14.28	13.4	13.16	12	11.6	10.96	10.72	9.56	9.08	8.64	8.64	5.68	5.56	3.24	2.72	1.16		

## » Results by labour intensity

- In economies experiencing a positive labour shock, the most labour-intensive sectors grow the most. The opposite occurs in economies experiencing a decline.
- Sectors with high labour intensity are typically manufacturing sectors like Machinery and equipment, Textile and wearing apparel, Other manufacturing, and Electronic equipment, but also services sectors such as Business services and Trade and storage.
- Differentiated impacts of restrictions to movement of labour across sectors and countries through changes of relative factor endowments, as per Rybczynski (1955).

### Global remittance flows

- In METRO, after paying income taxes, households send a fixed share of their factor income abroad as remittances.
- The reduction in labour supply reduces overall household income, and hence remittances.
- In the top three source economies for remittance outflows the fall is 0.3% for the United States, 0.7% for Canada and 0.5% for Australia. This is reflected by a drop in net inflows in destination countries.

## » Conclusions

- The results show that it is the OECD countries, the majority of which gain additional labour from international mobility flows, which would suffer the most economically from a prolonged reduction.
- An economic expansion is seen in many non-OECD countries where the additional labour increases both potential output and competitiveness.
- The mobility reduction decreases the supply of labour.
- In both models this leads to a rise in wages and a deterioration in competitiveness and exports.
- In NiGEM the factor of production loss diminishes economies potential output and there is a decrease in the capital stock.
- The addition of the capital channel changes the ranking of the impact on economies and so adds an important source of variation to the scenario.
- At the sectoral level the reduction in exports is most consequential in manufacturing sectors.

## Joint modelling

- In using the models collaboratively capital stock adjustment derived from NiGEM is fed into METRO.
- NiGEM has the advantage that investment changes lead to changes in the capital stock.
- The use of NiGEM thus allows the mobility scenario in METRO to capture capital adjustment and also have these changes underpinned by a different framework.
- From a practical perspective it is a benefit that these relevant and complex channels can be added to METRO without making any changes to the core model.
- In its current comparative static format, METRO focusses on the re-allocation of given resources following a shock or policy change.

# Contact us

We look forward to hearing from you!



Access all of the information from the Trade & Agriculture Directorate at:

[www.oecd.org/tad](http://www.oecd.org/tad)



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