

# Scenarios for long-term economic city growth – Models and results for selected CORFU case studies

Friso Schlitte  
Hamburg Institute of International Economics  
HWWI

ICFR, 5-7 September 2013, Exeter

# Contents

- Introduction
- Drivers of regional growth
- Methodology
- Application examples
  - The case of Hamburg, Germany
  - The case of Dhaka, Bangladesh

# Introduction

Why are economic scenarios relevant for flood issues in urban areas?

- Demand for land and type of land use
  - Settlement structure
  - Type and location of industries
  - Physical infrastructure
- Monetary issues
  - Public budgets and private wealth
  - Monetary value of physical capital (potential damages)
- Strategies dealing with flood issues should consider the socioeconomic development and its impact on the future state of the city

# Introduction

## Aim:

- Developing quantitativ long-term (2050) scenarios for population, income and employment growth on the regional level

## Challenges:

- Common methodology for very heterogeneous case study cities
  - Highly developed cities with high level of wealth, low dynamics, ...
  - Rapidly growing cities in developing/emerging countries with low income levels, weak institutions and high social inequalities
- Generating results with a minimum of data input
  - Availability of regional level data is generally poor (also in developed countries)
  - Quality and availability is much worse in developing/emerging countries

# Drivers for regional growth

- Regional growth is determined by many observable and unobservable factors
  - Global and national development
  - Demographic development
  - Qualification structure / level
  - R&D / Innovation
  - Sector structure / sectoral shifts
  - Variety of other idiosyncratic location factors
    - Accessibility, infrastructure, institutions, ...
    - soft location factors (quality of housing, education facilities, consumption amenities,...)
- Persistence of regional growth trends
  - circular, cumulative causation
  - When and why may a region leave an adopted growth path?
  - > Scenarios should be considered as plausible description of the future, not as prediction

# Methodology

## General procedure:

- Taking national growth and disaggregate to regional level
- Estimate regional deviations from national growth and extrapolate past relationship
- Step-wise approach:
  1. Ex-post analysis (estimating drivers and trends)
    - Panel data estimation
    - Identifying regional trends (as deviation from the national development)
    - Identifying specific drivers (e.g. skill level, knowledge intensity of production)
    - Industry-wise analysis
  2. Projections (applying ex post results and socio economic scenarios)
    - National economic and demographic projections
    - Regional demographic projections (if available)

# Methodology

## Population growth:

$$[1] \quad grPOP_{rt}^{15-64} = \gamma_0 + \gamma_1 grPOP_t^{15-64} + \tau_t + \kappa_r + u_{rt}$$

## Employment growth (in each industry separately):

$$[2] \quad grEMP_{rit} = \alpha_0 + \alpha_1 grEMP_{it} + \sum \alpha_n Controls_{rt} + \tau_{it} + \kappa_{ri} + u_{rit}$$

## Productivity (in each industry separately):

$$[3] \quad \ln \frac{GDP_{rit}}{EMP_{rit}} = \beta_0 + \beta_1 \ln \frac{GDP_{it}}{EMP_{it}} + \sum \beta_n Controls_{rt} + \kappa_{ri} + \tau_{it} * \kappa_{ri} + u_{rit}$$

## Production (in each industry separately):

$$[4] \quad GDP_{rit} = [3] * EMP_{ri(t-1)} (1 + [2])$$

WLS – estimation :

$$w_{rit} = \sqrt{\frac{x_{rit}}{x_{it}}}$$

where r=region, i=industry, t=year

# Application – The case of Hamburg

## Model input:

- Information on 97 German regions, 1996 to 2008
- Industry wise GDP and Employment
  - Agriculture, forestry and fishing
  - Industry (excluding construction)
  - Construction
  - Trade
  - Financial & business services
  - Non-market services
- Projections
  - National Working age population until 2050 (Statistical Office of Germany)
  - National economic projections (Oxford Global Economic Model)



# Application – The case of Hamburg

## National level scenarios for Germany

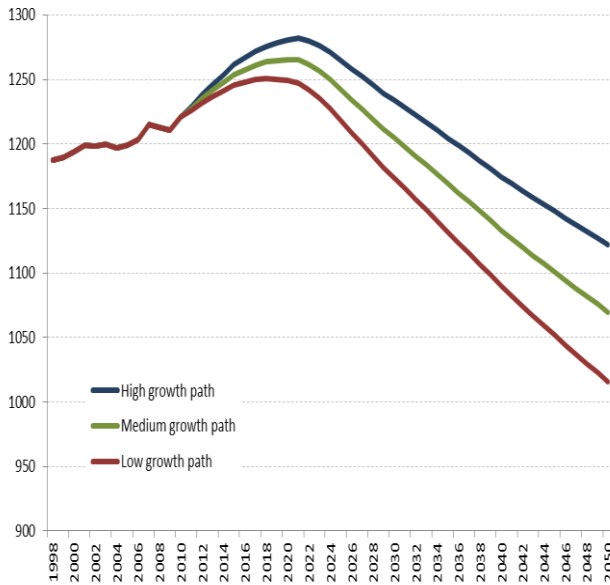
	low growth		medium growth		high growth	
	2050	growth rate, 2012 to 2050	2050	growth rate, 2012 to 2050	2050	growth rate, 2012 to 2050
GVA(billion Euro, 2005 prices)	2958	32%	3496	56%	4036	80%
Employment (total, tsd.)	29510	-29%	33012	-20%	36047	-13%
Population (aged 15-64,tsd.)	37577	-30%	40193	-25%	43395	-19%
Population (total, tsd.)	67411	-17%	71510	-12%	76703	-6%

Source: Statistical Office of Germany 2012, Oxford Economics 2012, own Calculations.

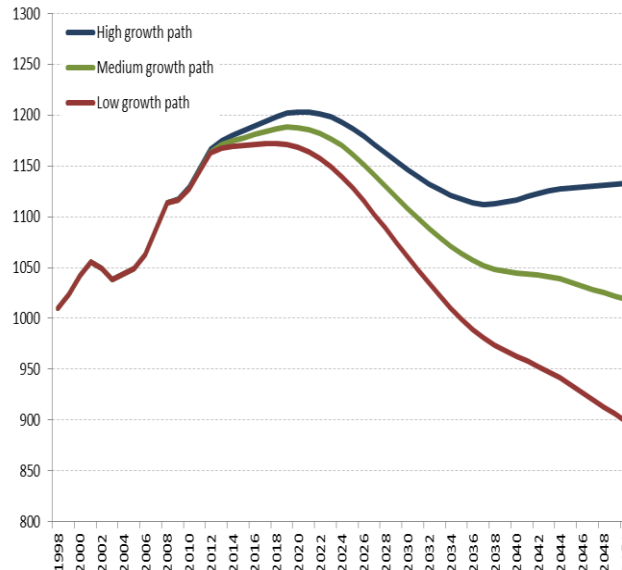
# Application – The case of Hamburg

## Scenario results:

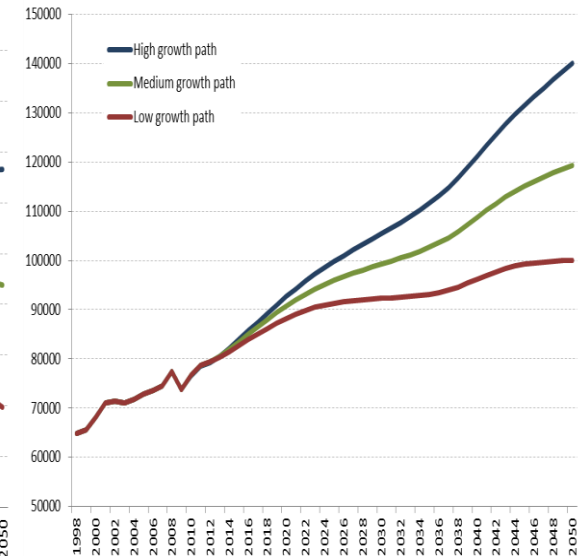
Working age population (in 1000)



Total employment (in 1000)



Total GVA (mio. €, 2005 prices)



# Application – The case of Hamburg

## Structural changes in Hamburg (sectoral GVA/total GVA)

	low growth		medium growth		high growth	
	difference in		difference in		difference in	
	% -points,		% -points,		% -points,	
	2050	2008 to 2050	2050	2008 to 2050	2050	2008 to 2050
Agriculture, forestry and fishing	0.2%	0.0%	0.2%	0.0%	0.2%	-0.1%
Industry (excl. Construction)	13.1%	-2.2%	13.4%	-1.9%	12.7%	-2.6%
Construction	2.4%	-0.8%	2.3%	-0.9%	2.0%	-1.2%
<b>Secondary sector</b>	<b>15.5%</b>	<b>-3.0%</b>	<b>15.7%</b>	<b>-2.7%</b>	<b>14.7%</b>	<b>-3.7%</b>
Trade	23.3%	-2.3%	23.5%	-2.0%	24.3%	-1.2%
Financial & business services	46.3%	11.9%	45.9%	11.5%	46.1%	11.6%
Non-market services	14.7%	-6.6%	14.6%	-6.7%	14.7%	-6.6%
<b>Tertiary sector</b>	<b>84.3%</b>	<b>3.0%</b>	<b>84.1%</b>	<b>2.8%</b>	<b>85.1%</b>	<b>3.8%</b>

# Application – The case of Dhaka

## Model input:

- Information on 64 districts, 1996 to 2000
- Industry wise GDP (only)
  - Agriculture, forestry and fishing, Industry (excluding construction), Construction, Trade, Financial & business services, Non-market services
  - Estimating GDP growth in fashion of equation [2]
- Regional (total) population from censuses 1991 and 2011
- Projections
  - National working age population and total GDP until 2050 (IIASA 2012)
  - No existing scenarios for sectoral disaggregated GDP in Bangladesh

# Application – The case of Dhaka

## National level scenarios for Bangladesh

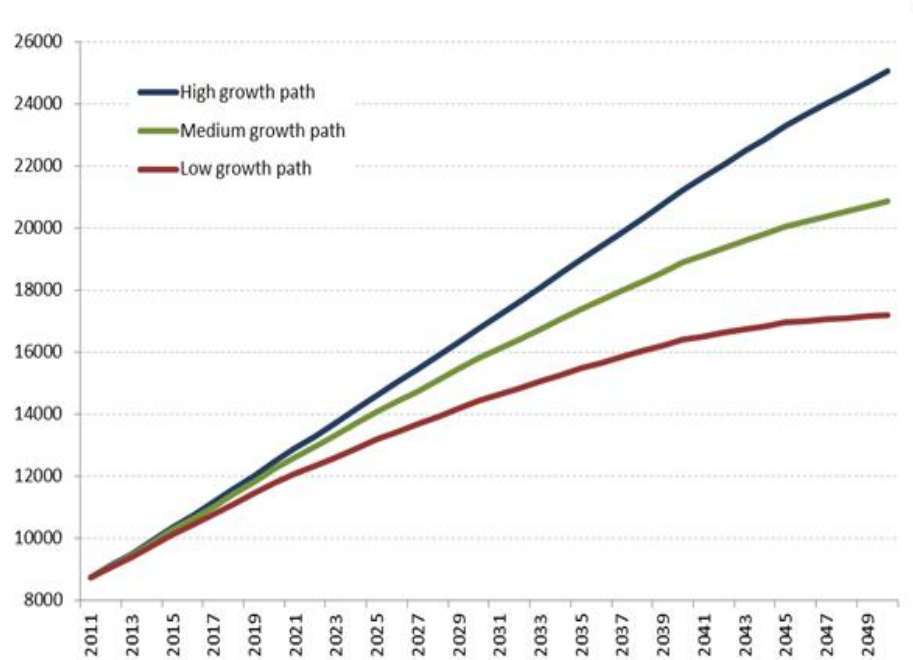
	SSP3 (=low growth)		SSP2 (=medium growth)		SSP1 (= high growth)	
	growth rate,		growth rate,		growth rate,	
	2050	2010 to 2050	2050	2010 to 2050	2050	2010 to 2050
GDP (billion US-\$, 2005 prices)	153	197%	366	612%	506	886%
Population (total, million)	214	44%	194	31%	195	31%
Population (aged 15-64, million)	142	49%	132	39%	131	37%
Share of population in urban areas	38%	36%	52%	84%	67%	138%

Source: SSP-Database, IIASA 2012 (prepared for the 5<sup>th</sup> IPCC-Report).

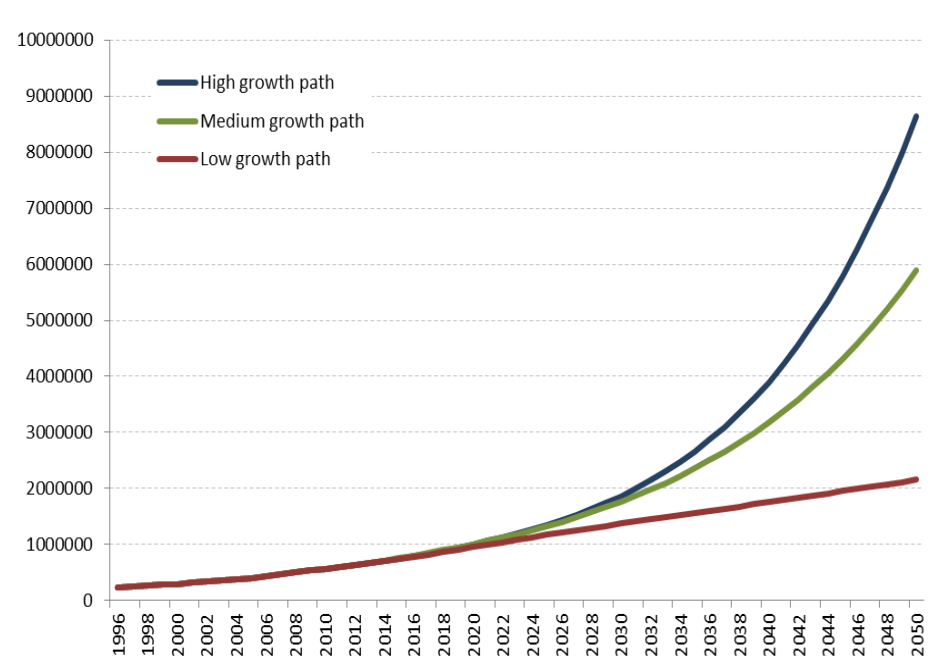
# Application – The case of Dhaka

## Scenario results:

Working age population (in 1000)



Total GDP (mio. Taka, 1996 prices)



# Application – The case of Dhaka

## Structural changes in Dhaka (sectoral GDP/total GDP)

	low growth		medium growth		high growth	
	difference in		difference in		difference in	
	2050	2008 to 2050	2050	2008 to 2050	2050	2008 to 2050
Agriculture, forestry and fishing	0.5%	-0.6%	0.3%	-0.8%	0.1%	-0.9%
Industry (excl. Construction)	36.7%	-2.0%	35.9%	-2.9%	32.0%	-6.7%
Construction	2.5%	-0.8%	1.9%	-1.4%	1.6%	-1.7%
<b>Secondary sector</b>	<b>39.2%</b>	<b>-2.8%</b>	<b>37.7%</b>	<b>-4.3%</b>	<b>33.6%</b>	<b>-8.4%</b>
Trade	21.3%	-10.8%	20.7%	-11.4%	21.8%	-10.3%
Financial & business services	31.3%	18.6%	34.9%	22.2%	37.7%	25.0%
Non-market services	7.7%	-4.4%	6.4%	-5.7%	6.7%	-5.4%
<b>Tertiary sector</b>	<b>60.3%</b>	<b>3.4%</b>	<b>62.0%</b>	<b>5.1%</b>	<b>66.2%</b>	<b>9.3%</b>



# Conslusions

- Common methodology for long term scenarios in very heterogeneous cities
- Methodology is adaptable to data availability
- Results are scenarios, not predictions



# Thank you!

Friso Schlitte  
Hamburg Institute of International Economics  
HWWI  
[schlitte@hwwi.org](mailto:schlitte@hwwi.org)

# Application – The case of Dhaka

## Scenarios for structural changes in Bangladesh (sectoral GDP/total GDP)

	SSP3 (=low growth)		SSP2 (=medium growth)		SSP1 (=low growth)	
	difference in		difference in		difference in	
	2050	2010 to 2050	2050	2010 to 2050	2050	2010 to 2050
Agriculture, forestry and fishing	11.9%	-8.3%	6.8%	-13.4%	3.1%	-17.0%
Industry (excl. Construction)	28.9%	8.1%	31.8%	10.8%	30.0%	9.1%
Construction	8.4%	-0.8%	7.2%	-2.0%	6.8%	-2.4%
Trade	20.1%	-5.5%	21.7%	-3.9%	23.8%	-1.9%
Financial & business services	17.7%	8.3%	21.4%	12.0%	23.5%	14.0%
Non-market services	12.9%	-1.7%	11.8%	-2.9%	12.9%	-1.8%

Source: Statistical Yearbooks of Bangladesh, 1999, 2005 and 2009; SSP-Database, IIASA, 2012; own calculations.

Regional cross-section:  
64 districts of Bangladesh

Time-series:  
- 1990 – 2000

Data:  
- GDP, employment by several  
different economic sectors  
- Population by gender, age,  
activity rate  
- So far missing: employment  
data and regional population  
projections

