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Green jobs potential in a skill-constrained economy

Analysis of different carbon tax recycling schemes for South Africa

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South Africa's development challenges: economic, social and environmental

- South Africa, a middle income country with multiple development issues:
 - GDP(PPP) per capita 2013: 12 000 \$(PPP) (108th worldwide) (WB)
 - low annual GDP growth: 2007-12: 3,1%, 2013-14: 1.6%, 2015: 2.1% (WB, IMF)
 - official unemployment about 25% for over a decade (StatsSA)
 - Gini index: from 0.67 in 2006 to 0.65 in 2011 (~150th worldwide) (WB)
 - skills shortage in 2005: post-sec grad. unemployment: 8.7% (univ.grad: 3.8%)
- Major environmental issues, and objectives:
 - high CO₂ emissions (2010): 9 tCO₂/capita (vs. Germany: 9.1) (ORNL)
 - Copenhagen Pledges, 2009 (COP15): Reduce GHG emissions by 34% in 2020 and 42% in 2025 relative to baseline: meaning 400-600 Mt CO_{2-eq} in 2035 (Janoska, 2014)
- CO₂ tax (Ctax) proposal in parliament (120 ZAR/tCO₂ starting 2016)
- Research Questions:
 - What revenue recycling achieves economic, social and environmental goals?
 - Can investment in education and skills boost the South African economy?

IMACLIM-South Africa

Tool for analysis of transitions

- Open economy CGE with exogenous growth, in a 1-step projection (2005-35)
- Hybrid dual energy/economy accounting to:
 - hybridise National Accounts data with energy data (quant. & prices)
 - inform behavioural specifications (technology): e.g. change in factor intensity of production of electricity (BU-model informed)
 - ideal for testing visions with experts and stakeholders
- 10 Products/Sectors (5 energy) with nested-CES production (except for electricity) and consumption functions
- Secondary income distribution (firms, government, 5 household classes)
- Second-best features:
 - mark-up pricing
 - imperfect labour markets: 3 skill levels, separated sub-markets

Reference projection and scenarios

- Reference Projection 2035 (RP):
 - no damage of climate change
 - productivity increase: capital (+2%/yr) and labour (+1%/yr)
 - constant international prices, exogenous export trend (+1.5%/yr)
 - education projection based on constant enrollment by education type
 - CO₂ tax (Ctax) scenarios for 2035:
 - Ctax: 100 ZAR₍₂₀₀₅₎/tCO₂ = 18 USD₍₂₀₁₂₎/tCO₂ (also: ZAR 300 & 500/tCO₂)
 - no border tax adjustment, no Ctax export rebates
 - no foreign or international Ctax
 - Recycling schemes:
 1. reduction of VAT/sales tax
 2. reduction of company and household revenue taxes
 3. lumpsum transfer to all households
- + Runs with scheme 1 and partial recycling into investment in education/skills

Results for Reference Projection and 3 scenarios for recycling Ctax ZAR100

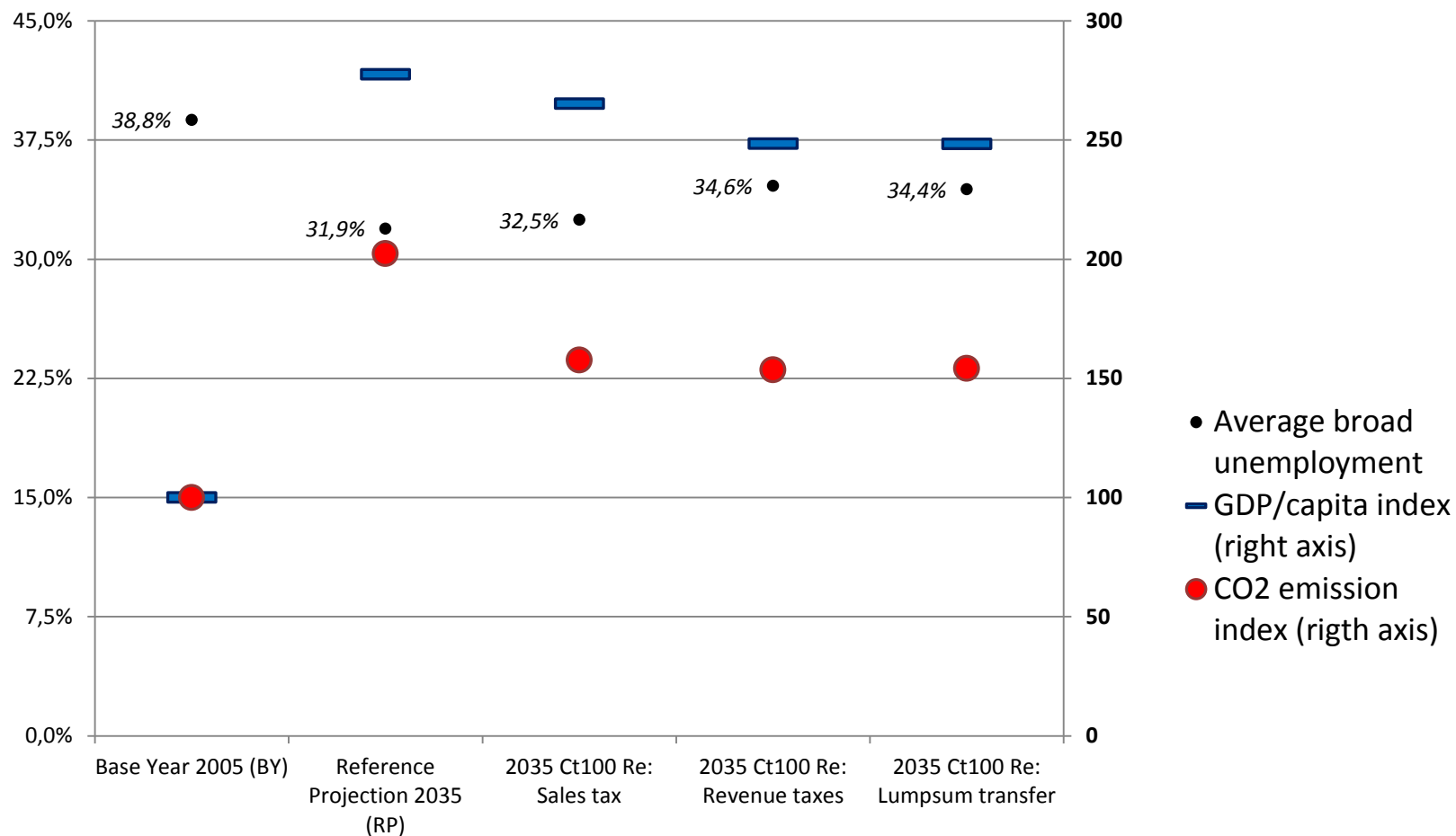


Table: Average unemployment (*numbers in italics*), and indices for GDP per capita and CO₂ emissions (both: right axis), for Base Year 2005 (BY), Reference Projection (RP), and 3 scenarios with a CO₂ tax of ZAR 100/tonne CO₂ and different recycling schemes

Results: Reference Projection and 3 scenarios for recycling Ctax ZAR100

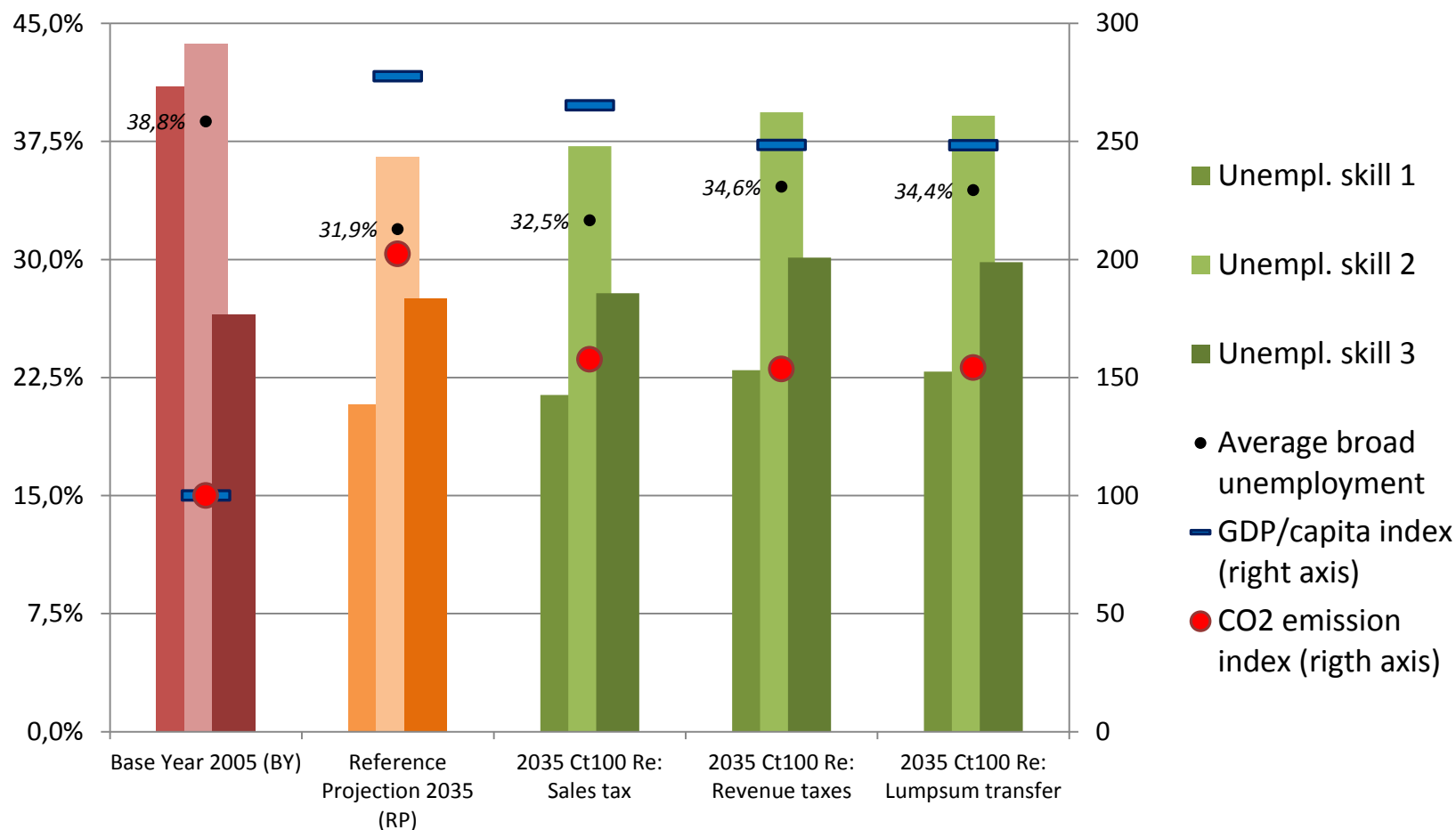
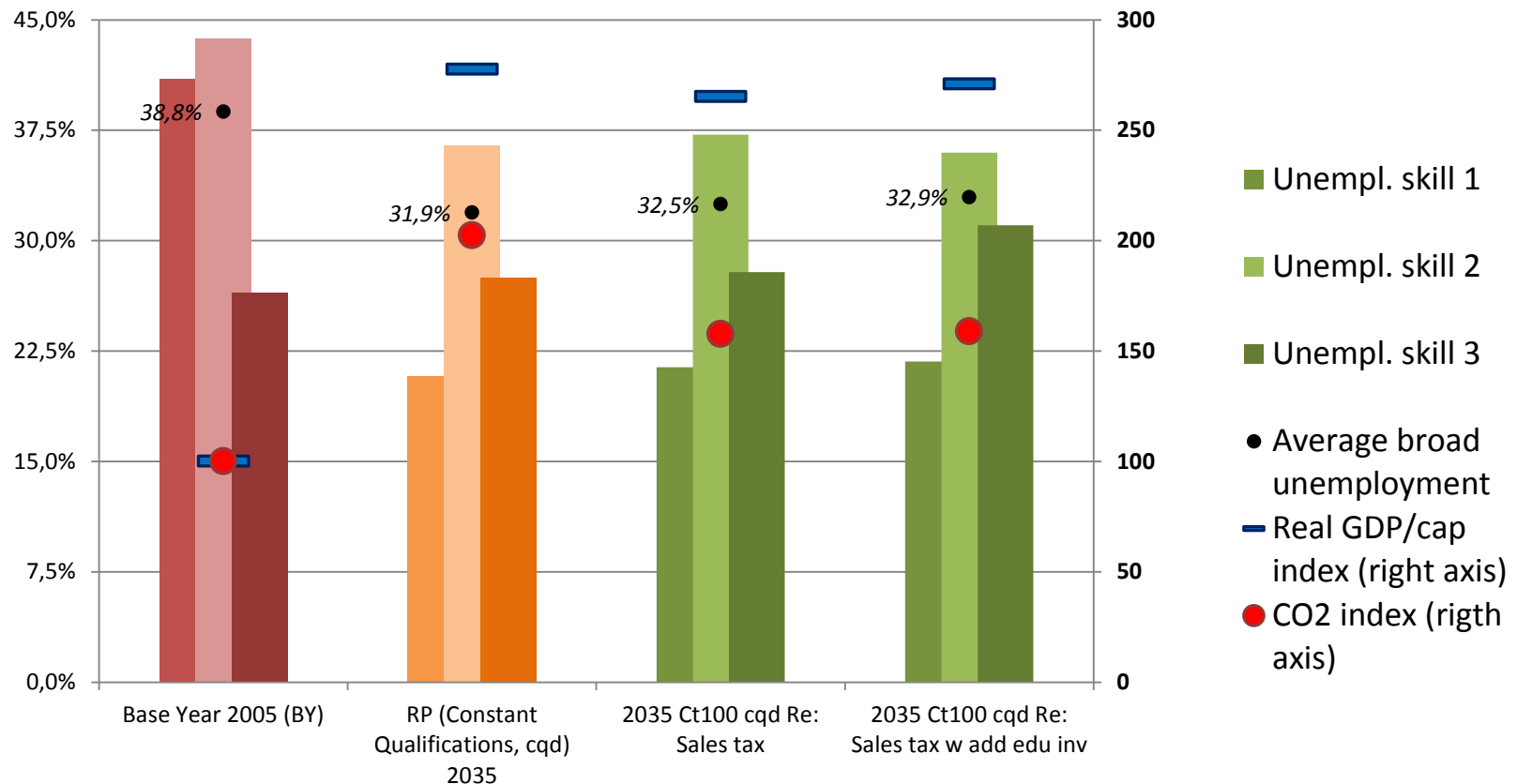


Table: Unemployment by skill level, avg. unemployment, and indices for GDP per capita and CO₂ emissions (both: right axis), for Base Year 2005 (BY), Reference Projection (RP), and 3 scenarios with a CO₂ tax of ZAR 100/tonne CO₂ and different recycling schemes

Recycling of Ctax in sales tax + investment in education



Education investment leads to a higher supply of skill 3 labour, leading to relatively lower labour costs for sectors that benefit from structural change under a Ctax.

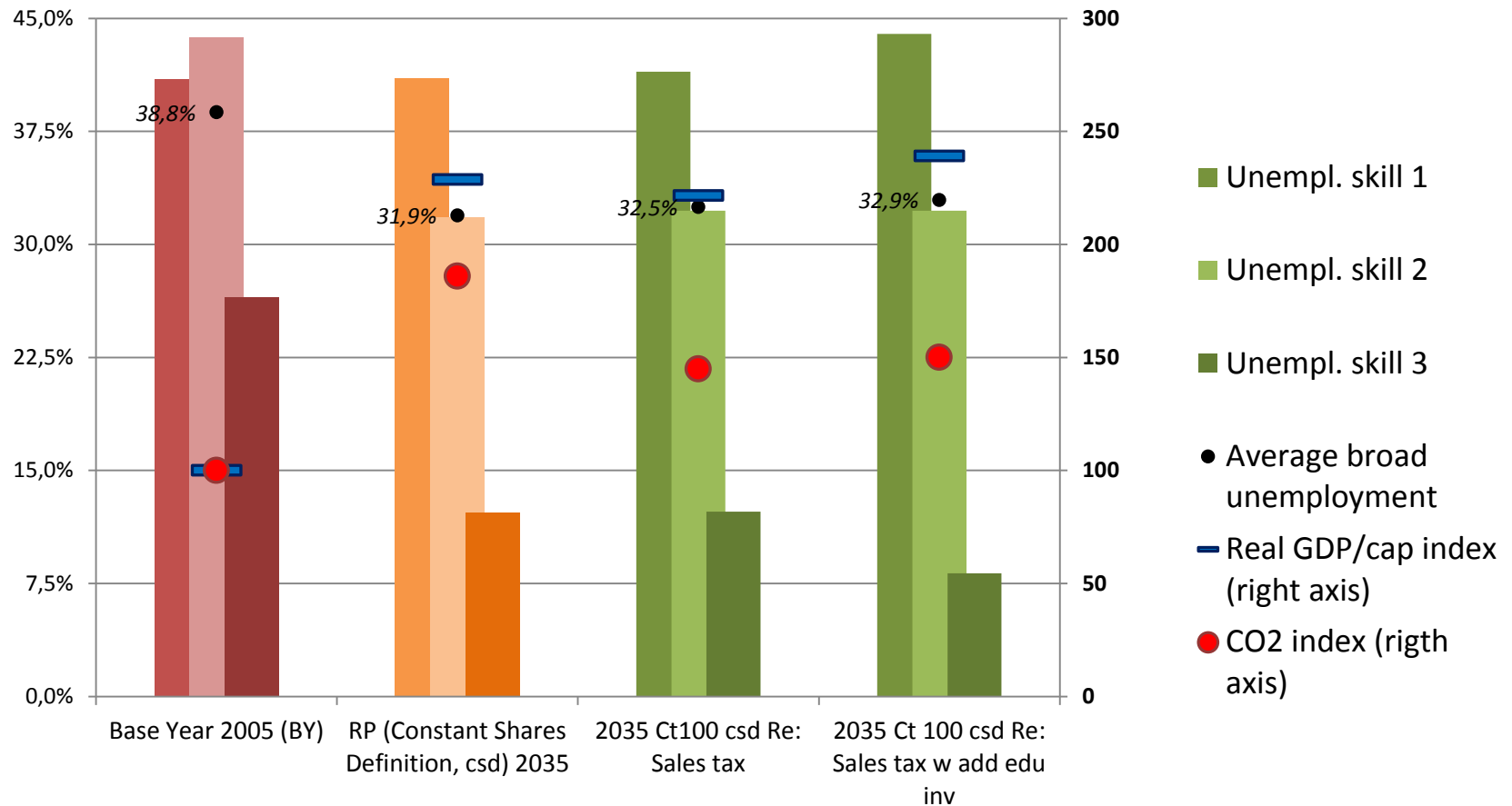
Subtle dynamics of skill-segmented labour in a CGE

1. Definition question: What is labour by skill level?
 - Constant Qualifications: degree determines labour force by skill
 - Upgraded Qualifications: requirements of skill level job types go up with educational level of population
 - Constant Shares of labour population: skill level job types use a fixed percentage of the labour force
2. Drivers for change of skill-intensity of production?
 - Due to changing productivity, relative factor prices, or other drivers?
3. Is income elasticity of consumption good-specific?
 - Do high-skill intensive goods have higher income elasticities?

How to get the dynamics of labour supply & demand by skill right?

- Options: Calibration vs. Constructing scenarios

Recycling of Ctax in sales tax + investment in education, under Constant Shares Definition (csd)



Investments in education increase productivity of the 3 skill segments and of capital. The result is more high-skilled intensive production.

Conclusions

➤ Methodological considerations:

- Studying inclusiveness, employment and skills, in a strongly developing economy requires labour market segmentation
- The subtle dynamics of skill differentiation require a careful investigation
- Scenario development can help overcome calibration problems

➤ Preliminary Policy implications:

- Under our CGE settings we find that the most beneficial recycling of a Ctax in South Africa is one that benefits consumption by reducing (other) sales taxes
- There is potential for investment in education to boost South Africa's economy, but the inclusiveness of this measure will depend on detailed labour market conditions and the design of the investment

Thank you for your attention!