Columbia Business School

The impact of broadband on jobs and the German economy

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Study Director:
Dr. Raúl L. Katz, Adjunct Professor, Division of Finance and Economics, and Director, Business Strategy Research, Columbia Institute of Tele-information

Co-authors:
Patrick Zenhäusern, Polynomics AG
Dr. Stephan Suter, Polynomics AG
Dr. Philippe Mahler , Polynomics AG

Germany's broadband strategy aims to ensure that 75% of households have access to at least 50 Mbps by 2014, with the goal of building an ultra broadband infrastructure by 2020

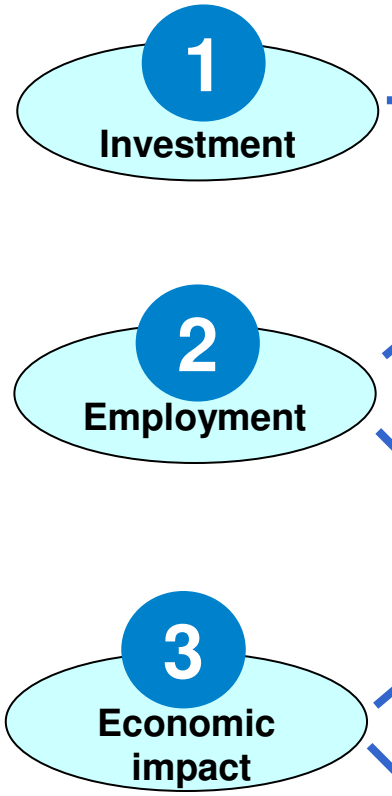
Federal Government Broadband Strategy (2010-2014)

- Encourage operators to deploy wireless and mobile broadband services with at least 1Mbps in rural areas currently without broadband coverage via DSL or cable
- Upgrade "Grey zone" areas (speeds between 384 Kbps and 1 Mbps) to 1 Mbps and more
- Ensure that 75% of German households have access to a broadband connection of at least 50Mbps by 2014, with the goal that such access lines should be available as soon as possible over the whole German territory

Ultra-broadband Scenario (2020)

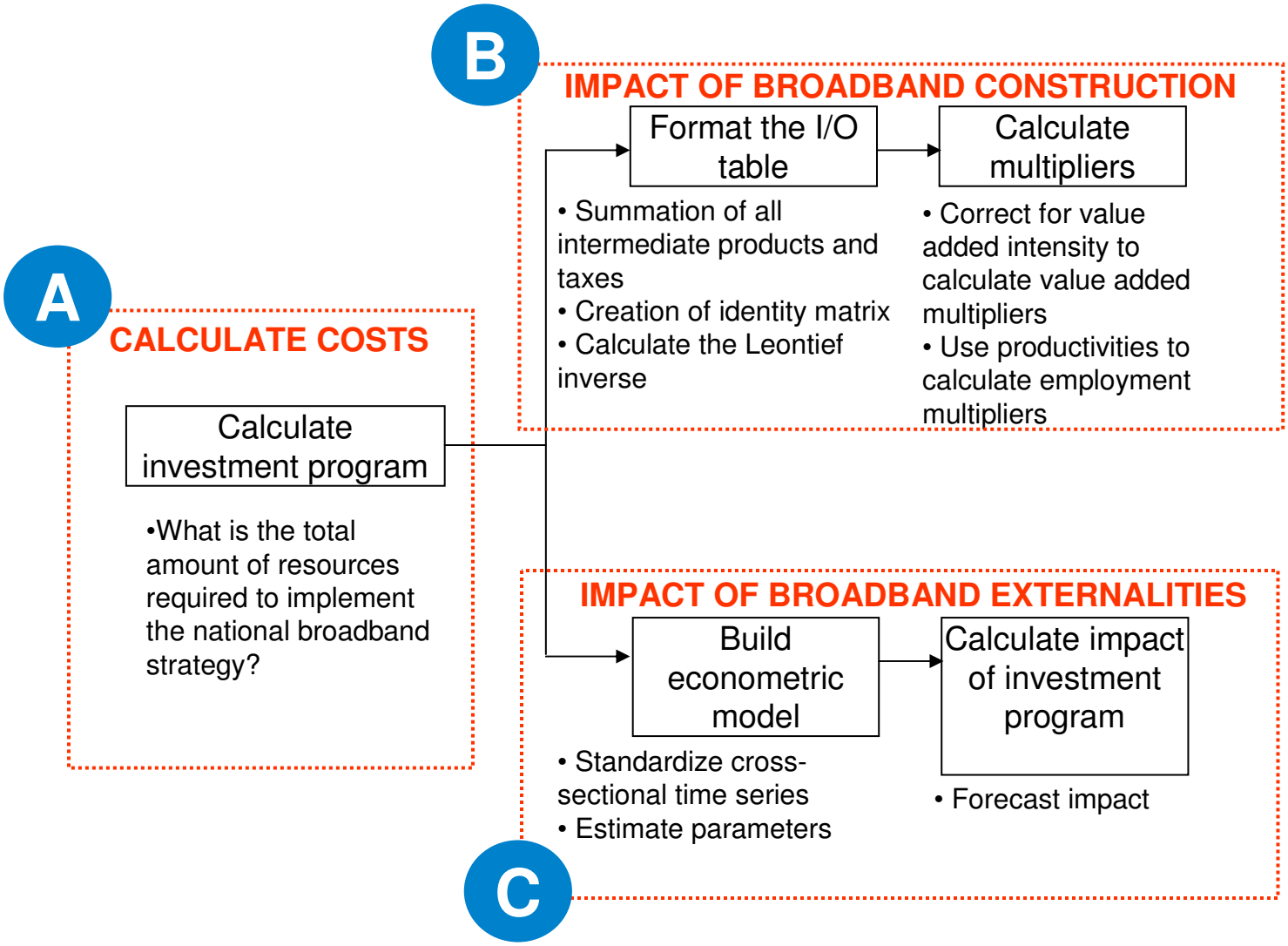
- Deliver at least 100 Mbps to 50% of households
- Deliver at least 50 Mbps to the next 30% of households
- Offer broadband services under 50 Mbps to the remaining population (20%)

This study was undertaken to assess the impact of this strategy on German employment and the economy



- What are the **costs of deploying broadband** due to the National Broadband Strategy (2014) and due to broadband evolution (2020) in Germany?
- **How many jobs** will the National Broadband Strategy be capable of generating as a result of network deployment in 2014 and because of broadband evolution in 2020?
- How large will the **employment creation effect** be once the National Broadband Strategy is deployed?
- What will the impact be in terms of **domestic value added resulting from network construction**?
- What is the **incremental GDP growth** that can be linked to broadband deployment?

The study comprised a set of rigorous analytic techniques, supported by input-output analysis and econometric models

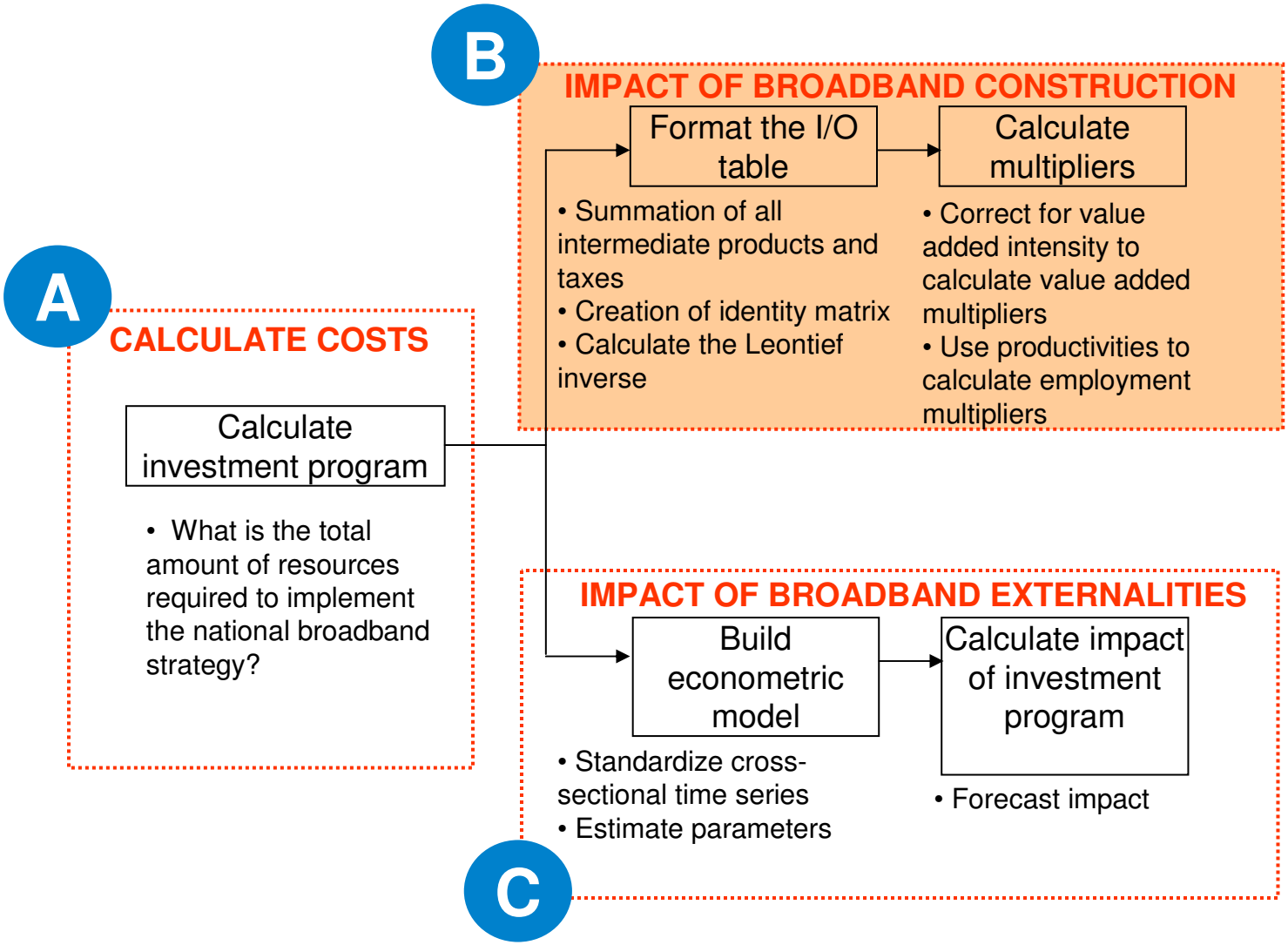


A The broadband strategy will require an investment of 20.2 billion Euros by 2014, and 15.7 billion incremental by 2020

Covering "white spots"	*2014*	924 Million EUR	• Cover unserved households (730,000) with a mix of wireless (480,000 lines) and wireline broadband technologies (250,000 lines)
Upgrade "grey spots"	*2014*	336 Million EUR	• Upgrade "Grey spot" households (2,800,000) to 1 Mbps
VDSL	*2014*	6,747 Million EUR	• Provide 19,861,000 households (or 50%) with VDSL service by 2014 • Provide 11,916,600 households (or 30%) with VDSL service by 2020
Ftth	*2014*	12,236 Million. EUR	• Provide 9,930,500 households (or 25%) with Ftth service by 2014 • Provide 19,861,000 households (or 50%) with Ftth service by 2020
	2020	15,690 Million EUR	
$\sum$ Total 2014 2020	*2014*	20,243 Million EUR	• By 2014, universal broadband supply with 75% of households receiving over 50 Mbps • By 2020, universal broadband supply with 80% of households receiving over 50 Mbps, and 50% over 100 Mbps
	2020	15,690 Million EUR	

Source: Own calculations based on ADL (2009), JP Morgan(2006), WIK (2008), AT Kearney (2008), EU-US expericences, Analysis Mason (2008)

The investment costs allowed to estimate job creation and economic impact resulting from construction of the broadband network



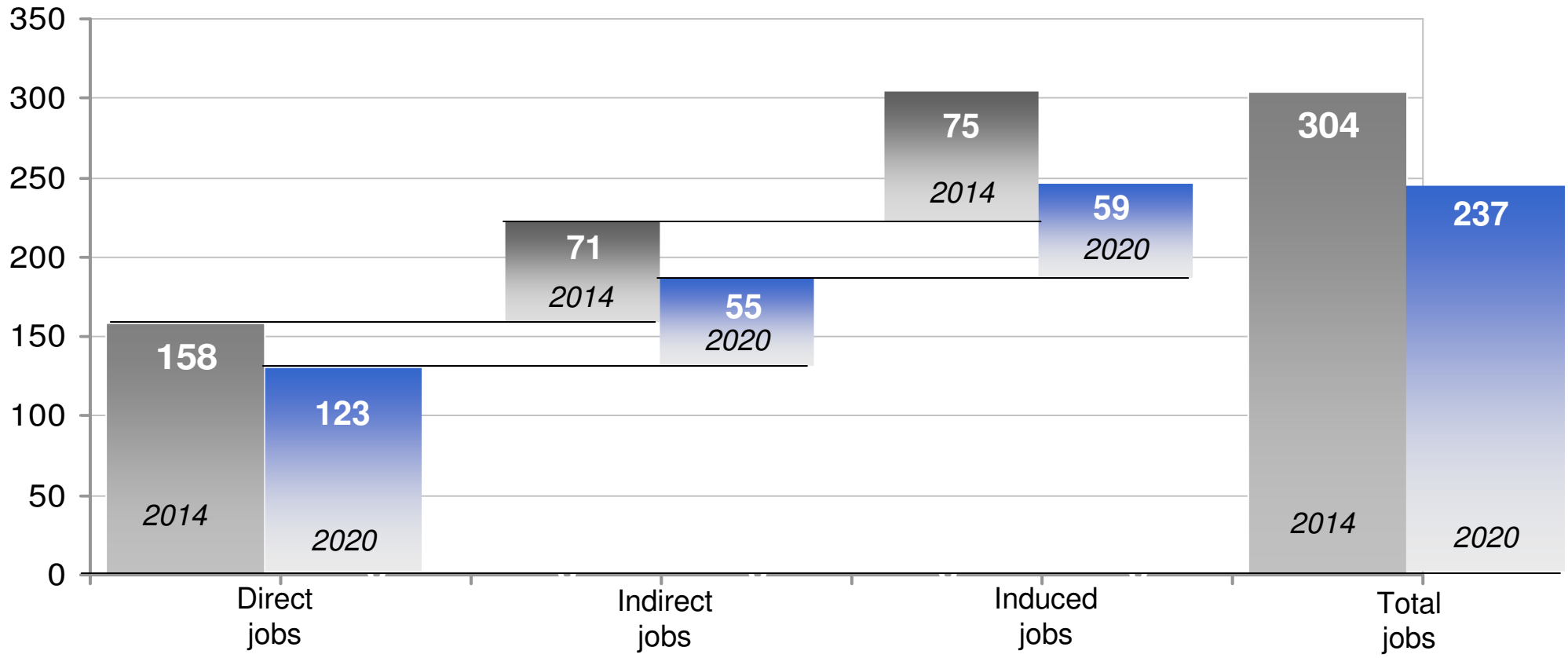
B Three types of network construction effects exist

Direct jobs and output	• Employment and economic production generated in the short term in the course of deployment of network facilities	• **Telecommunications technicians** • **Construction workers** • **Civil and RF engineers**
Indirect jobs and output	• Employment and production generated by indirect spending (or businesses buying and selling to each other in support of direct spending)	• **Metal products workers** • **Electrical equipment workers** • **Professional Services**
Induced jobs and output	• Employment and production generated by household spending based on the income earned from the direct and indirect effects	• **Consumer durables** • **Retail trade** • **Consumer services**

B The implementation of the broadband strategy will result in significant one-time job creation: 541,000

Employment impact of broadband construction

2014: 304,000 jobs (or 60,800 per year 2010-14)
2020: 237,00 jobs (or 39,500 per year 2015-20)



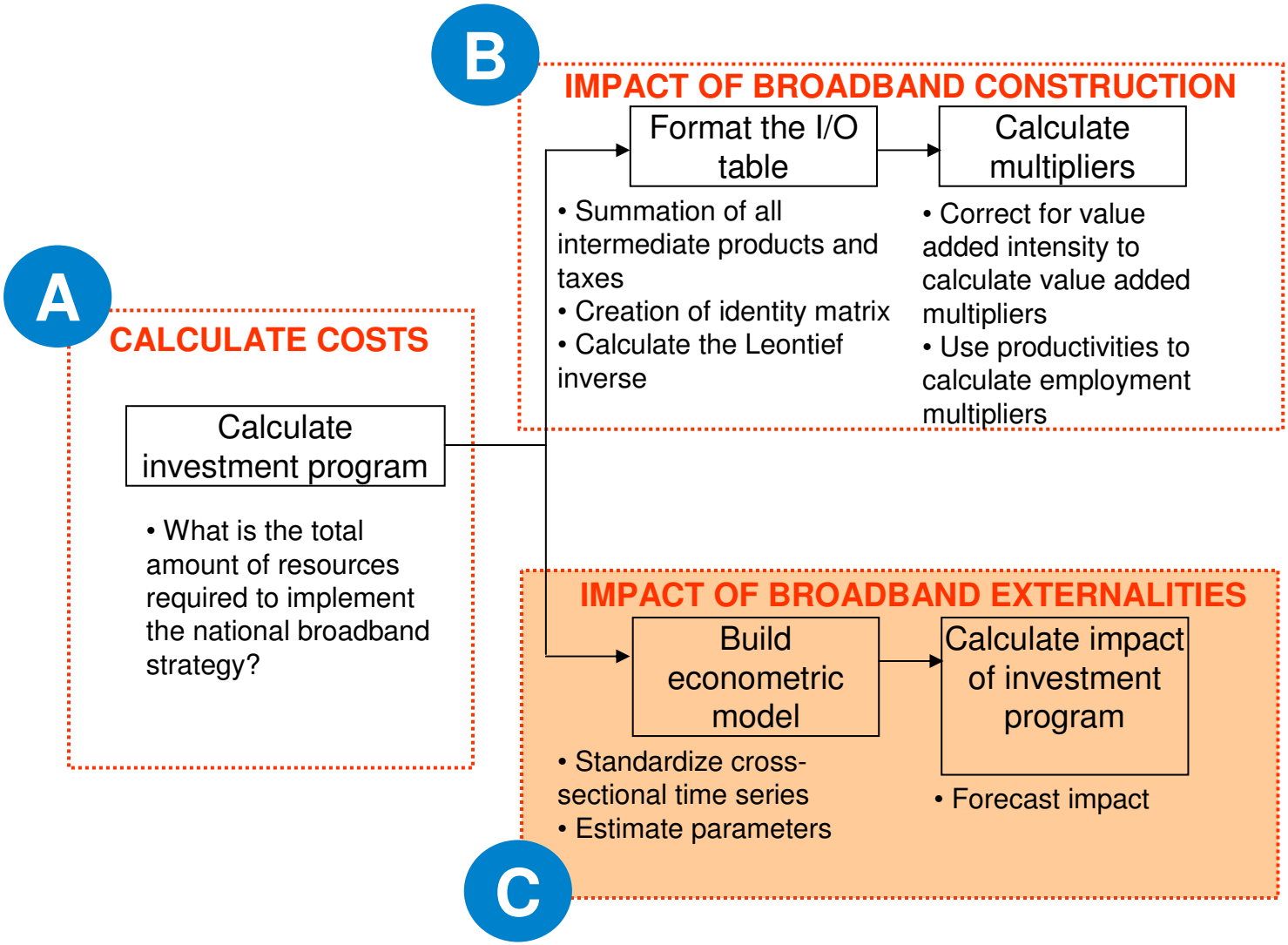
Source: Own calculations using 2005 Germany's Input-Output Tables from Eurostat

B In addition, the implementation of the broadband strategy will create a significant amount of domestic value added with low "leakage"

Investments	*2014: 20,243 Million Euros* *2020: 15,690 Million Euros*	
Total additional production	*2014: 52,324 Million Euros* *2020: 40,749 Million Euros*	• 2014: Each 1.00 Euro invested in broadband infrastructure generates 2.58 Euros in output • 2020: Each 1.00 Euro invested in broadband infrastructure generates 2.60 Euros in output
Domestic Value added	*2014: 18,733 Million Euros* *2020: 14,631 Million Euros*	• 2014: Impact of broadband strategy: Germany will achieve 18,733 Mio EUR in domestic value added (incremental GDP) (2011-14) • 2020: Impact of broadband evolution: Germany will achieve 14,631 Mio EUR in domestic value added (incremental GDP) (2015-20)
Imported	*2014: 4,146 Million Euros* *2020: 3,148 Million Euros*	• 2014: Only 7.9% of output results from investment "leaked" overseas • 2020: Output "leaked" overseas decreases to 7.7% because of the construction intensity (domestic) of Ftth

Source: Own calculations using 2005 Germany's Input-Output Tables from Eurostat

Once the broadband network is deployed, additional job creation and economic impact will result from externalities

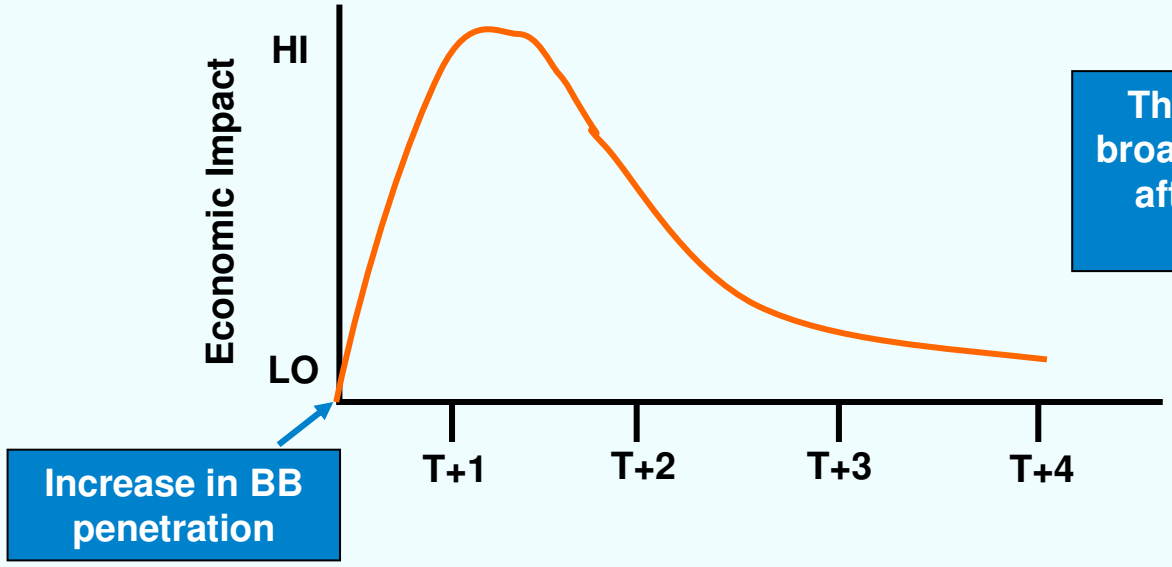


C Broadband infrastructure yields three network effects

Productivity	• Improvement of productivity as a result of the adoption of more efficient business processes enabled by broadband	**• Marketing of excess inventories** **• Optimization of supply chains**
Innovation	• Acceleration of innovation resulting from the introduction of new broadband-enabled applications and services	**• New applications and services (telemedicine, Internet search, e-commerce, online education, VOD and social networking)** **• New forms of commerce and financial intermediation**
Value chain recomposition	• Attract employment from other regions as a result of the ability to process information and provide services remotely	**• Outsourcing of services** **• Virtual call centers** **• Core economic development clusters**

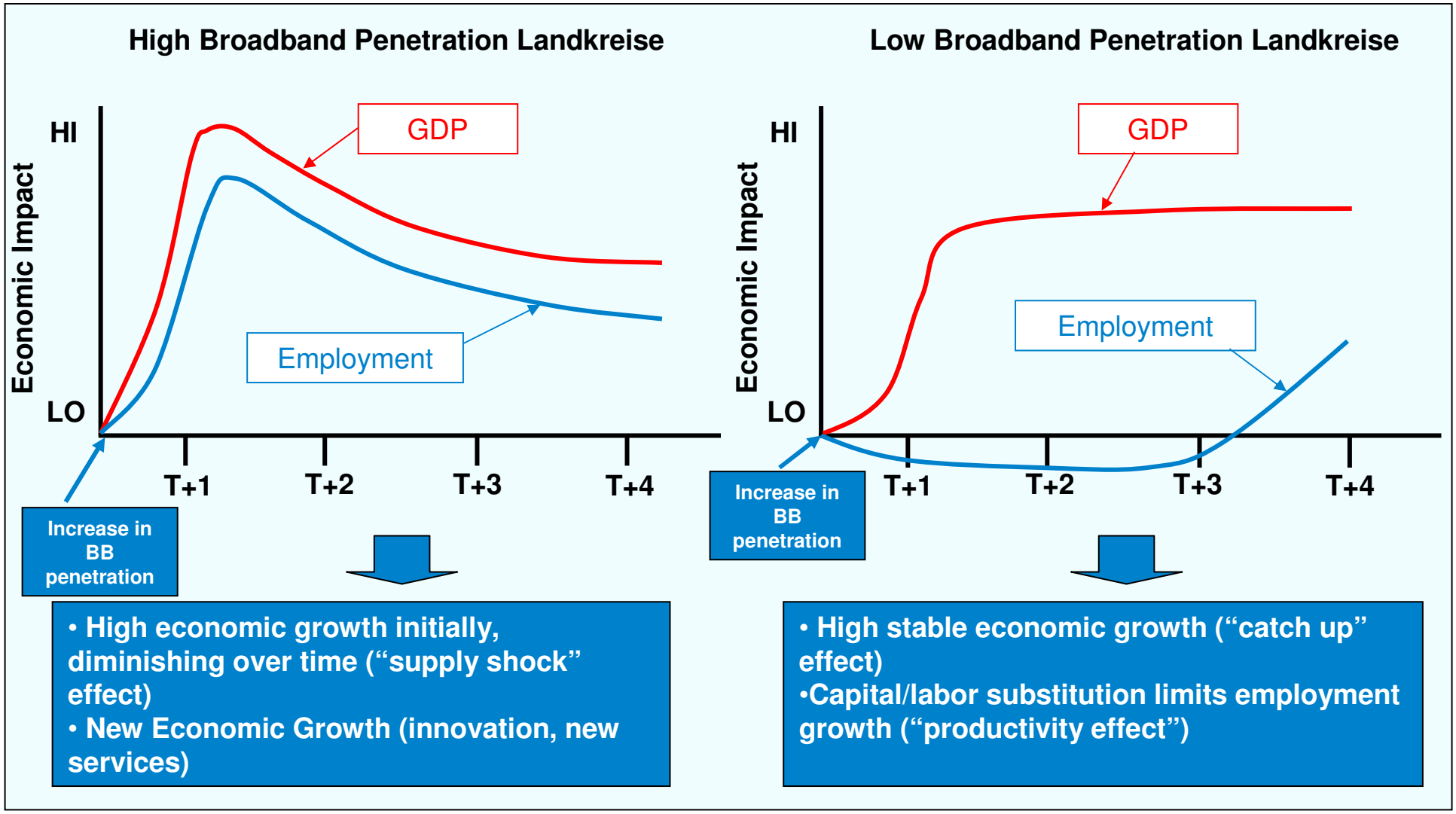
C Economic impact of broadband in terms of network externalities have been found to be significant throughout Germany

- Our analysis estimated the impact of increase in broadband penetration on rate of economic growth and job creation
- Aggregate results for the whole territory indicate that broadband penetration has a significant short-term effect on economic growth



The economic stimulus impact of broadband is highest in the first year after increase in penetration and tends to diminish over time

C Different economic impact profiles result from distinct levels of broadband penetration within regions



C An extrapolation of externalities over a ten year period yields 427,000 jobs and 137 billion EUR in output

EXTERNALITIES OF BROADBAND DEPLOYMENT

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
EMPLOYMENT											
		24	35	44	54	54	54	54	54	54	427
2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
GROSS DOMESTIC PRODUCT											
		13.9	14.5	14.9	15.7	15.7	15.7	15.7	15.7	15.7	137.5

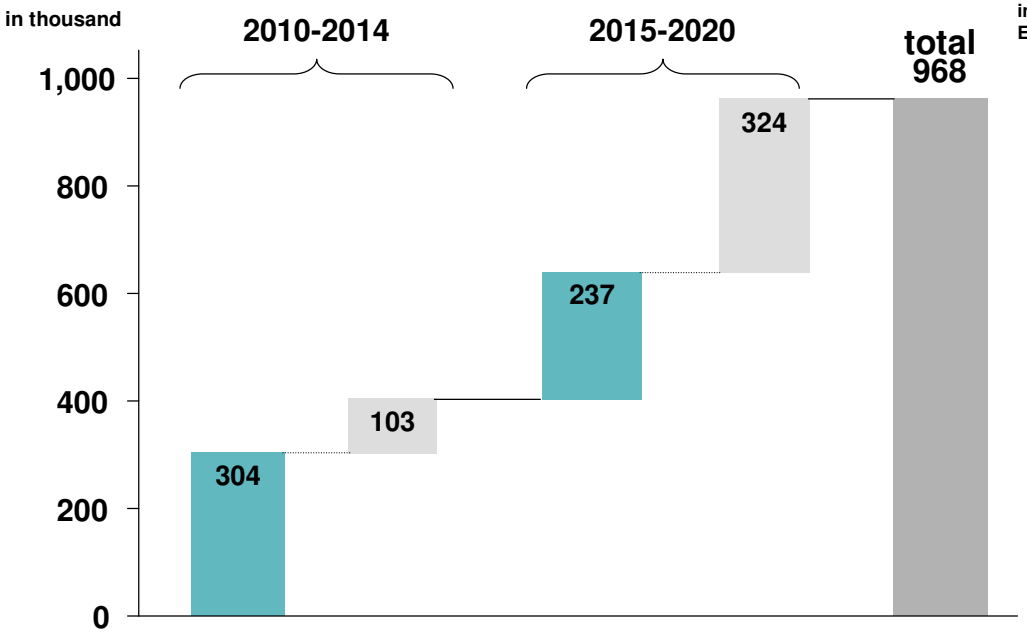
No externalities due to network under deployment

Externalities discounted to prevent double-counting with I/O estimates

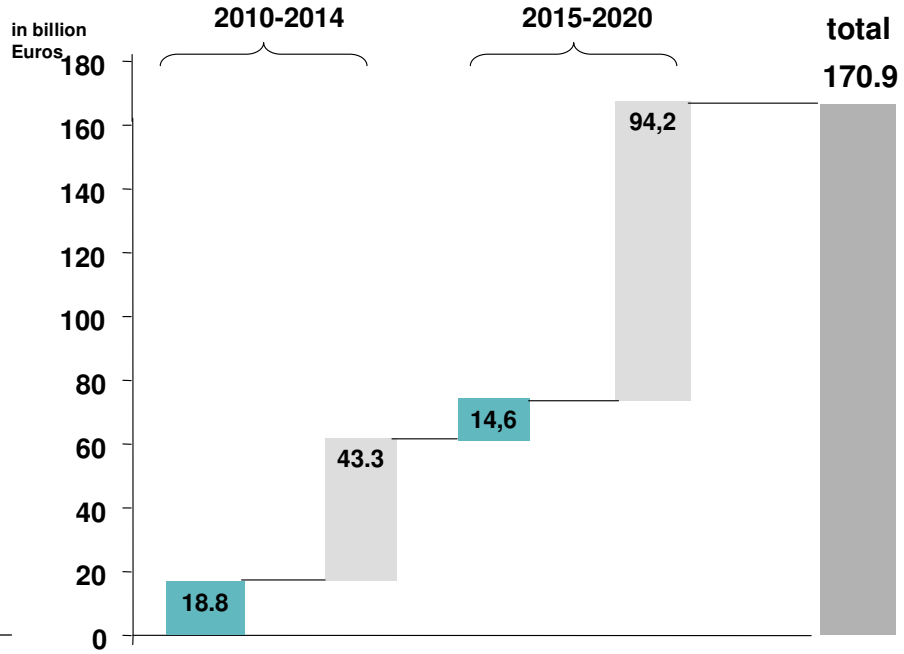
Externalities calculated based on annual model estimates

The National Broadband Strategy will generate significant effects of on jobs and the German economy

EMPLOYMENT IMPACT (in thousands)



GDP IMPACT (in billion Euros)



Network Construction Network externalities

Why Should Governments invest in broadband infrastructure in the current environment?

- Generate jobs and output as a result of the construction of networks
  - Estimates for network construction jobs are fairly robust and consistent with prior research
  - Employment multipliers: between 1.92 and 3.42
  - Output multiplier: every Euro invested in infrastructure, generates 0.93 Euros in domestic value added
- Promote innovation, and creation of new businesses once the networks are deployed
  - Additional 0.60% in GDP growth
  - Accelerate development of core regions
  - Attract new industries, with employment potential

Policy and research implications

- Job fulfillment is driven by success in implementing job creation and retention programs that could be enabled by broadband
- Policy implications:
  - Coordinate broadband deployment with job creation and retention programs
  - Refine criteria for selecting areas to deploy broadband based on the stimulus
  - Centralize program evaluation and grant allocation
  - Develop systematic tests based on social and economic criteria to evaluate the return on the investment
- Research agenda:
  - Economic impact of NGAN?
  - Is there a saturation effect limiting broadband impact?