The Economics of German Unification, Twenty-Five Years Later

Michael C. Burda
Humboldt-Universität zu Berlin, CEPR, and IZA

Mark Weder
Adelaide University

Korean Unification: Prospects and Global Implications
Washington DC, 27-28 February 2017
Overview

- Initial conditions for the German Democratic Republic in 1990
- East-West German integration, as seen through the lens of Solow and Swan (1956)
- East-West German integration, as seen through the lens of Ramsey (1928) – maximizing discounted utility
- East-West German integration, as seen through the lens of Solow (1957) – the role of TFP
- Lessons for Korean unification
Lens of Solow and Swan (1956)

- Neoclassical growth model
- Originally closed economy, Barro and Sala-i-Martin (1991, 1995) opened it to include factor mobility
- Assumes common production function (TFP convergence is instantaneous)
- Empirically, (conditional) convergence rate of GDP per capita is impressively robust at about 2%/year (Barro and Sala-i-Martin (1991, 1992))
- Consistent with the Solow/Swan neoclassical model without any factor mobility and a capital share of 2/3
Convergence

Figure 1: Per capita GDP. German states, 1991
Convergence

Figure 2: Per capita GDP, German states, 2015

The Economics of German Unification, 25 years later
Lens of Solow and Swan (1956)

Figure 3: Growth and Investment in the German states

The Economics of German Unification, 25 years later
Lens of Solow and Swan (1956)

Figure 4: Convergence
Lens of Ramsey (1928)

- What is the social planner’s optimum as opposed to the market outcome? How closely did Germany approximate it?
- First obligation of the social planner: Maximize the pdv of utility in east and west, possibly equally weighted
- Constrained by overall resources, fixed factors, cost of adjustment, externalities with respect to public goods and congestion, as well as a distortionary financing constraint
- Separate production from consumption decisions – frontload „investment“ in structural change but raise consumption immediately
- Subsidize housing to reduce migration; tax labor income
## Lens of Ramsey (1928)

### Convergence in the Small: Access to Consumption Goods

<table>
<thead>
<tr>
<th>Durable Good</th>
<th>1993 East/West</th>
<th>1998 East/West</th>
<th>2008 East/West</th>
<th>2016 East/West</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automobile</td>
<td>66/74</td>
<td>71/76</td>
<td>73/78</td>
<td>70/79</td>
</tr>
<tr>
<td>Landline telephone</td>
<td>49/97</td>
<td>94/97</td>
<td>86/91</td>
<td>100/92</td>
</tr>
<tr>
<td>Cell phone</td>
<td>-/-</td>
<td>11/11</td>
<td>86/86</td>
<td>95/95</td>
</tr>
<tr>
<td>Personal Computer</td>
<td>16/22</td>
<td>34/40</td>
<td>72/76</td>
<td>87/89</td>
</tr>
<tr>
<td>Internet access</td>
<td>-/-</td>
<td>5/9</td>
<td>58/66</td>
<td>88/90</td>
</tr>
<tr>
<td>Television</td>
<td>96/95</td>
<td>98/95</td>
<td>95/94</td>
<td>98/98</td>
</tr>
<tr>
<td>Cable access</td>
<td>-/-</td>
<td>64/51</td>
<td>55/46</td>
<td>55/43</td>
</tr>
<tr>
<td>Satellite dish</td>
<td>-/-</td>
<td>30/29</td>
<td>34/40</td>
<td>39/50</td>
</tr>
<tr>
<td>Video recorder</td>
<td>36/49</td>
<td>61/63</td>
<td>-/-</td>
<td>-/-</td>
</tr>
<tr>
<td>Refrigerator</td>
<td><strong>95/97</strong></td>
<td>99/99</td>
<td>99/99</td>
<td>100/100</td>
</tr>
<tr>
<td>Microwave oven</td>
<td>15/41</td>
<td>41/53</td>
<td>70/70</td>
<td>74/73</td>
</tr>
<tr>
<td>Dishwasher</td>
<td>3/38</td>
<td>26/49</td>
<td>55/64</td>
<td>64/71</td>
</tr>
<tr>
<td>Washing Machine</td>
<td>91/88</td>
<td>94/91</td>
<td>-/-</td>
<td>98/96</td>
</tr>
<tr>
<td>Dryer</td>
<td>2/24</td>
<td>14/33</td>
<td>22/42</td>
<td>24/46</td>
</tr>
</tbody>
</table>

*Source: German Federal Statistical Office (2016)*
Life Expectancy

Source: Human Mortality Database (2016)

The Economics of German Unification, 25 years later
Lens of Ramsey (1928)

Happiness

Life Satisfaction Since 1991

On a ladder of life from 0 to 10, on which step do you stand at the present time?
Percent saying 7, 8, 9 or 10

WEST GERMANY | EAST GERMANY | RUSSIA | POLAND | UKRAINE
---|---|---|---|---
52% | 61% | 59% | 43% | 38%
15% | 6% | 12% | 8% | 23%

Source: Pewglobal (2014)
## Lens of Ramsey (1928)

### Convergence in the Large: Macroeconomic Indicators in East Germany in relation to West Germany

<table>
<thead>
<tr>
<th>Year</th>
<th>Private consumption</th>
<th>Nominal wages per hour</th>
<th>Nominal wages per worker</th>
<th>Labor productivity per hour</th>
<th>Labor productivity per worker</th>
<th>GDP per capita</th>
<th>Unemployment rate</th>
<th>Participation rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>64</td>
<td>n.a.</td>
<td>57</td>
<td>n.a.</td>
<td>45</td>
<td>44</td>
<td>165</td>
<td>116</td>
</tr>
<tr>
<td>1993</td>
<td>75</td>
<td>n.a.</td>
<td>74</td>
<td>n.a.</td>
<td>67</td>
<td>59</td>
<td>193</td>
<td>107</td>
</tr>
<tr>
<td>1995</td>
<td>82</td>
<td>n.a.</td>
<td>78</td>
<td>n.a.</td>
<td>72</td>
<td>67</td>
<td>163</td>
<td>109</td>
</tr>
<tr>
<td>1997</td>
<td>83</td>
<td>n.a.</td>
<td>79</td>
<td>n.a.</td>
<td>74</td>
<td>68</td>
<td>177</td>
<td>109</td>
</tr>
<tr>
<td>1999</td>
<td>84</td>
<td>n.a.</td>
<td>79</td>
<td>n.a.</td>
<td>75</td>
<td>68</td>
<td>195</td>
<td>108</td>
</tr>
<tr>
<td>2001</td>
<td>85</td>
<td>73</td>
<td>80</td>
<td>72</td>
<td>76</td>
<td>67</td>
<td>235</td>
<td>106</td>
</tr>
<tr>
<td>2003</td>
<td>86</td>
<td>74</td>
<td>80</td>
<td>73</td>
<td>78</td>
<td>69</td>
<td>216</td>
<td>106</td>
</tr>
<tr>
<td>2005</td>
<td>85</td>
<td>75</td>
<td>81</td>
<td>73</td>
<td>78</td>
<td>69</td>
<td>187</td>
<td>103</td>
</tr>
<tr>
<td>2007</td>
<td>85</td>
<td>74</td>
<td>80</td>
<td>73</td>
<td>78</td>
<td>70</td>
<td>201</td>
<td>104</td>
</tr>
<tr>
<td>2009</td>
<td>87</td>
<td>75</td>
<td>81</td>
<td>74</td>
<td>80</td>
<td>72</td>
<td>186</td>
<td>105</td>
</tr>
<tr>
<td>2011</td>
<td>85</td>
<td>76</td>
<td>82</td>
<td>74</td>
<td>79</td>
<td>71</td>
<td>188</td>
<td>104</td>
</tr>
<tr>
<td>2013</td>
<td>80</td>
<td>76</td>
<td>82</td>
<td>75</td>
<td>80</td>
<td>71</td>
<td>173</td>
<td>103</td>
</tr>
<tr>
<td>2015</td>
<td>n.a.</td>
<td>79</td>
<td>81</td>
<td>78</td>
<td>n.a.</td>
<td>72</td>
<td>161</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

*Source: German Federal Statistical Office, Bundesagentur für Arbeit*
The traces of structural change

Figure 9: Unemployment rates, October 2016
The Economics of German Unification, 25 years later

Labor market in November 2016

Unemployment rate (%)

Germany
5.7  Nov 16
6.0  Nov 15

West
5.3  Nov 16
5.4  Nov 15

East
7.8  Nov 16
8.5  Nov 15

Berlin
9.2  Nov 16
10.0 Nov 15
The curse of Bismarck?

Social security contributions as a fraction of total employee costs, West Germany (1970-1992) and Germany (1992-2013)

Source: OECD
Also in Korea?

Source: OECD

The Economics of German Unification, 25 years later
Lens of Solow (1957): TFP Convergence?

• While the 2% rule seems to work for Eastern Germany over the whole sample, it didn’t for the first ten years – in the past decade labor productivity and GDP/capita have ceased

• More likely a conditional proposition – to a different steady state (different production function, different steady state level of TFP)

• Refers to research with Battista Severgnini (2015)
Lens of Solow (1957): TFP Convergence?

Denison-Hall-Jones TFP estimates and GDP per capita, 2011

Figure 5: Total factor productivity (TFP) and GDP levels
Lens of Solow (1957): Counterfactuals

Figure 7: Counterfactual Output
Lens of Solow (1957): Counterfactuals

Figure 8: Counterfactual employment ratios
TFP: What is it?

Figure 1: Labor productivity, expressed as a fraction of Baden-Württemberg (BW)'s, 1993-2013
TFP: What is it?

Contribution of capital to labor productivity \((K/Y)^{\alpha}/(1-\alpha)\).

The Economics of German Unification, 25 years later
TFP: What is it?

Contribution of total factor productivity (TFP).
TFP: What is it?

Figure 3: Contributions of capital and TPF in the East-West. Denison-Hall-Jones Decomposition 1991-2011.
Table 2: Denison-Hall-Jones decomposition of labor productivity in German region-states, 2011, relative to Baden-Württemberg

<table>
<thead>
<tr>
<th>Region/State</th>
<th>Total Economy</th>
<th>Agriculture</th>
<th>Industry</th>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\frac{Y}{L}$</td>
<td>$(\frac{K}{Y})^{1-\alpha}$</td>
<td>$\frac{Y}{L}$</td>
<td>$(\frac{K}{Y})^{1-\alpha}$</td>
</tr>
<tr>
<td>Baden-Württemberg</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Bavaria</td>
<td>1.01</td>
<td>1.05</td>
<td>0.95</td>
<td>0.98</td>
</tr>
<tr>
<td>Berlin / Brandenburg</td>
<td>0.84</td>
<td>1.05</td>
<td>0.80</td>
<td>0.94</td>
</tr>
<tr>
<td>Lower Saxony / Bremen</td>
<td>0.91</td>
<td>1.01</td>
<td>0.90</td>
<td>1.36</td>
</tr>
<tr>
<td>Hamburg / Schleswig-Holstein</td>
<td>1.04</td>
<td>0.99</td>
<td>1.05</td>
<td>0.98</td>
</tr>
<tr>
<td>Hessen</td>
<td>1.07</td>
<td>0.95</td>
<td>1.13</td>
<td>0.99</td>
</tr>
<tr>
<td>Mecklenburg-West Pomerania</td>
<td>0.72</td>
<td>1.20</td>
<td>0.60</td>
<td>1.69</td>
</tr>
<tr>
<td>North Rhine-Westphalia</td>
<td>0.96</td>
<td>0.93</td>
<td>1.03</td>
<td>1.34</td>
</tr>
<tr>
<td>Rheinland-Palatinate</td>
<td>0.89</td>
<td>1.08</td>
<td>0.82</td>
<td>1.22</td>
</tr>
<tr>
<td>Saarland</td>
<td>0.89</td>
<td>1.04</td>
<td>0.86</td>
<td>0.86</td>
</tr>
<tr>
<td>Saxony</td>
<td>0.72</td>
<td>1.09</td>
<td>0.66</td>
<td>1.16</td>
</tr>
<tr>
<td>Saxony-Anhalt</td>
<td>0.73</td>
<td>1.14</td>
<td>0.64</td>
<td>1.80</td>
</tr>
<tr>
<td>Thuringia</td>
<td>0.70</td>
<td>1.13</td>
<td>0.62</td>
<td>1.29</td>
</tr>
<tr>
<td>Eastern Germany including Berlin</td>
<td>0.76</td>
<td>1.09</td>
<td>0.69</td>
<td>1.33</td>
</tr>
<tr>
<td>Western Germany excluding Berlin</td>
<td>0.98</td>
<td>0.99</td>
<td>0.99</td>
<td>1.13</td>
</tr>
<tr>
<td>All Germany</td>
<td>0.94</td>
<td>1.01</td>
<td>0.93</td>
<td>1.17</td>
</tr>
</tbody>
</table>

Source: Authors’ calculations based on Statistische Bundesamt, Volkswirtschaftliche Gesamtrechnungen.
Summary of Burda/Severgnini (2015)

• Significant TFP differentials explain persistent East-West gaps in GDP per capita and labor productivity
• Sectoral differences exist, manufacturing dominates
• Capital intensity in East Germany now exceeds that of West Germany in industrial sectors
• Frontier approach of Griffith, Redding and van Reenen (2004) links TFP growth to distance to the frontier and R&D
• Very strong explanatory power of manager intensity and density of semi-professionals
• Suspicion that it may also have to do with distrust and lack of social capital
Lessons for Korean Unification

• Back of the envelope: It will be really big and expensive
• Providing North Korea’s 25 million with half of South’s 2015 per capita consumption would cost about $160 billion, or about 11% of South GDP ($1.4 trillion).
• This can be expected to last until the North ramps up output, which judging from Germany will take five years (for TFP) or ten years (for West German K/Y)
• Matching Germany’s per capita investment in the East for first seven years about (4000 EUR annually of GDP at the time) adds another 2-3% of SK GDP
Lessons for Korean Unification

• Expensive! 13-15% of GDP. Who’s gonna pay?
• South Korea may not be „scalable“ to the North – low TFP in East Germany has hardly moved in 15 years
• Social system will be a massive burden to Korea‘s competitiveness if extended without qualification to the North (see German experience)
• At currently low (and possibly rising) interest rates, it makes sense to create a sovereign fund to prepare for the day – otherwise unaffordable
The Economics of German Unification, Twenty-Five Years Later

Michael C. Burda
Humboldt-Universität zu Berlin,
CEPR, and IZA

Mark Weder
Adelaide University

Korean Unification: Prospects and Global Implications
Washington DC, 27-28 February 2017