

# FALLING BEHIND

THE EAST GERMAN ECONOMY  
IN COMPARISON WITH WEST  
GERMANY FROM 1936 TO 2002

RIJKSUNIVERSITEIT GRONINGEN

FALLING BEHIND: THE EAST GERMAN ECONOMY IN COMPARISON WITH  
WEST GERMANY FROM 1936 TO 2002

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## Chapter 1

### Introduction

#### 1.1 The case of two Germanies

During the period from 1936 to 2002 the shape of Germany showed major changes, marked by (a) the expansion of the *Third Reich*; (b) the division of Germany into occupation zones in 1945; (c) the founding of the German Democratic Republic (GDR) and the Federal Republic of Germany (FRG) in 1949; (d) the unification of the GDR and the FRG in 1990. No matter what period is described, the analysis and estimates for East Germany in this thesis refer to the territory – associated with – the GDR, and for West Germany they refer to the territory – associated with – the FRG before unification.<sup>1</sup>

Before the expansion of the *Third Reich* the East German economy had the signs of a blossoming landscape. At that time per capita national income amounted to 103 per cent of West Germany, compared to a mere 31 per cent in 1991. In the industrial sector labour productivity dropped from 91 per cent of the West German level in 1936 to merely 31 per cent in 1991. Before the Second World War the level of East German labour productivity met high international standards, as it was ranked at a tenth position. After the fall of the Berlin Wall many countries achieved a higher labour productivity than in East Germany, leaving this region at a rank somewhere between Mexico and Chile.<sup>2</sup> During his re-election campaign in 1990 Helmut Kohl promised (the reappearance of) a ‘blossoming landscape’ in East Germany. Many researchers find challenge in predicting the time needed,<sup>3</sup> others wonder whether this day will ever come.<sup>4</sup>

This thesis looks backwards to investigate the relative wealth of East Germany around the mid-1930s, to analyse the economic gains and losses between 1936 and 1991. The withering East German landscape provides a special case study for a persistent theme in economic

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<sup>1</sup> This means that I imposed the boundaries of 1949 (for West Germany the boundaries of 1960) on the period from 1936 to 1945, including a division of Berlin. Other adjustments for geographical discontinuities include the areas lost after World War II and the Saar territory that was alleged to France until 1959. As a result statistics refer to the same geographical territory for different periods in time. See Annex D for a map of the German boundaries.

<sup>2</sup> Maddison (1995); Maddison (2001)

<sup>3</sup> Burda (1995)

history: what are the causes of the wealth and poverty of nations?<sup>5</sup> Here is a case of an economy that was relatively wealthy, but lost out in relatively short time due to a complex interaction of political, social and economic events. It is my aim to measure the performance of the East German economy relative to that of West Germany, to shed further light on which factors were key to this process.

The analysis focuses on the production side of the economy and distinguishes between sectors (e.g. agriculture, mining, manufacturing) and manufacturing branches (e.g. food, machinery, textiles). The main indicators used are comparisons of the growth and relative levels of value added and labour productivity of the East German and West German economies from 1936 to 2002.

Obviously the changes of the German geographical constellation coincided with changes of the political, institutional and economic environment. The historical profession often uses such changes to mark the beginning or the end of a period. Most (economic) historians have therefore focused their study on the period from 1945 to 1989.<sup>6</sup> Similarly much of the economic research focuses on the post-unification period.<sup>7</sup> A major contribution of this thesis is that it covers the entire period from 1936 to 2002. Firstly the integration of pre-division and post-unification data are helpful in constructing a better data set for East Germany for the intermediate period from 1950 to 1989. Secondly there is a profound interest in the effects of (sudden) changes of the political, institutional and economic environment on the wealth and poverty of nations. Such 'shocks' are often believed to be important.<sup>8</sup> This study estimates the importance of these historical accidents for the East German economy falling behind.

In the following sections of this chapter I discuss the initial conditions (1936 – 1950), the economic systems of capitalism and socialism (1950 – 1989), and transformation and unification (1989 – 2002). Periodisation isolates the historical accidents around the Second World War and those related to the tumbling down of the Berlin Wall. Three possibilities may be put forward to explain for the East German economy falling behind relative to that of West Germany. Firstly, the initial conditions of East Germany were unfavourable in comparison with West Germany. Secondly, the performance of the East German economy was less successful than the performance in West Germany. Thirdly, the East German economy 'mismatched' with West Germany when the two economies integrated.

<sup>5</sup> Landes (1999); Cameron and Neal (2003)

<sup>6</sup> Heimann (1997); Ritschl, (1996); Schwarzer (1999)

<sup>7</sup> Brakman, Garretsen, and Schramm (1999); Sinn (2000)

## 1.2 Initial conditions (1936 – 1950)

The issue of the initial conditions is often put forward as a paradox: was it a bad start or a bad performance that explains the East German backwardness relative to West Germany? In fact both explanations are closely related. On a mathematical level, the initial labour productivity level combined with the growth rates allow extrapolation to the current level of labour productivity. Given the low levels of labour productivity in East Germany relative to West Germany in the late 1980s, Wagener stated that: the better the initial conditions, the worse the growth rates must have been.<sup>9</sup> And *vice versa*.

Such ‘derived’ evidence on the East German growth rates is useful as in the literature the official East German growth rates are very much distrusted.<sup>10</sup> In Chapter 6 of this thesis I will elaborate further on the accuracy and on the comparability of the (official) East German statistics. Information on the East German initial conditions can provide supportive ‘evidence’ for the trustworthiness of the East German growth rates. In an elaborate attack on “western cold war propaganda” the East German author Barthel (1979) claimed that East Germany had a bad start in comparison to West Germany.<sup>11</sup> This can be seen as an implicit defense of the officially reported high East German growth rates: the East German growth performance had to be good, given the bad initial conditions (and given the contemporary estimates of the East German level of labour productivity).

On a theoretical level, ‘initial conditions’ show a window of opportunities for the period after 1950. This relates to the relative ease to imitate existing technologies in comparison to inventing new ones. Through the adoption of more advanced technologies and modern institutions the ‘backward’ country can catch up with more advanced countries. These ideas built on studies of Gerschenkron and Abramovitz,<sup>12</sup> whose main findings concern the advantages of backwardness and the conditions for the exploitation of these advantages respectively. Thus, quantitatively, a measure of economic performance at the beginning of the period (and also the period since transformation and unification) provides an anchor for the statistics on the period from 1950 to 1989. If East Germany had a bad start; it possibly also had a good potential for growth.

However, the significance of examining the ‘initial conditions’ during the 1930s and 1940s goes beyond reexamining the period from 1950 onwards. It also gives insight in the economic

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<sup>8</sup> Maddison (1991) pp. 108 ff.

<sup>9</sup> Wagener (1996), pp. 24, 25

<sup>10</sup> Von der Lippe (1995); Melzer and Stäglich, (1991)

<sup>11</sup> Barthel (1979) pp. 13-28

impact of the complex developments at that time. What were the effects of the Second World War and the division of Germany on the East German and West German economies?

In Chapter 3 the economic growth performance of the two German economies between 1936 to 1950 are analysed in a growth accounting framework, which decomposes output growth into growth of labour inputs, growth of capital inputs and total factor productivity. The framework was developed as a tool of historical description emanating from the historical national income research program at the U.S. National Bureau of Economic Research during the early 1950s and since mainly builds on the pioneering work by Abramovitz and Solow.<sup>13</sup> Its use for the analysis of the two German economies from 1936 to 1950 is that it helps to identify the effects of widely varying issues such as war damage, dismantling, war casualties, migration, etceteras on capital and labour input.

Between 1936 and 1950 the two parts of Germany developed into two independent political and economic entities. This process was characterised by the introduction of their own monetary, fiscal and social policies. This can be seen as the opposite of economic integration: economic disintegration.<sup>14</sup> Due to the establishment of a new physical border labour and capital could not move as freely as before. In the case of the mobility of people (labour) the building of the Berlin Wall in 1961 has become a main symbol. However, already in the 1950s the mobility was sharply reduced through the closing down of the border (except for Berlin). People needed permission to travel to West Germany, and permission was less and less granted as East Germany faced the wandering off of many inhabitants. Besides a reduction of factor mobility there was also a reduction of the movement of commodities: trade between East- and West Germany deteriorated. Before the Second World War a division of labour between the two parts of Germany may be expected; thereafter it disappeared.

In Chapter 3, I provide estimates of the level of East German labour productivity in the industrial sector relative to West Germany for two benchmark years: 1936 and 1954. These benchmarks provide important building stones for the debate on the initial conditions. Firstly it estimates the actual labour productivity level of the two German economies. Secondly it improves the knowledge on the industrial structure in East Germany and West Germany. Were there differences in patterns of specialisation in 1936? And if so, who inherited the most productive industrial structure: East Germany or West Germany? What were the effects of the division, i.e. economic disintegration?

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<sup>13</sup> Abramovitz, (1956); Solow (1956); Solow (1957)

### 1.3 Economic system and economic performance (1950 – 1989)

This thesis measures the economic performance in the two German economies by gross domestic product per capita and gross domestic product per worker. The two indicators relate as gross domestic product per capita may increase either through an increase of participation in labour (in per cent of the total population more people are employed), or through an increase of labour productivity (i.e. gross domestic product per worker). Importantly the increase of gross domestic product per capita based on a higher participation is not sustainable as it (ultimately) suffers from diminishing returns. Labour productivity may improve through the use of capital inputs instead of labour inputs, through new technologies, and through the reallocation of labour inputs from sectors with a low productivity level to sectors with a high level of labour productivity.

In the case of the East German and West German economies it is particularly interesting to examine how economic performance links up with the existence of different economic systems. There exists a *communis opinio* that for the period from 1949 to 1989 East Germany should be categorised as a centrally planned economy and West Germany as a market economy, even though literature on economic systems has much struggled with matters of definition.<sup>15</sup> A study of Elliott defined an economic system as “a set of relations among decision-makers and between decision-makers and economic variables. It consists of the sum of ideas, goals, methods, and institutions used in society to resolve these economic issues in some more or less organised or ‘systematic’ way”.<sup>16</sup>

This relates very much to the ideas of North, who advocated the incorporation of institutions in economic analysis and stated the following.<sup>17</sup> (1) Economic models are specific to particular constellations of institutional constraints that vary radically both through time and cross sectional in different economies; (2) A self-conscious incorporation of institutions will force social scientists in general, and economists in particular, to question the behavioral models that underlie their disciplines; (3) Ideas and ideologies matter, and institutions play a major role in determining just how much they matter; (4) The polity and the economy are inextricably interlinked in any understanding of the performance of an economy and therefore we must develop a true political economy discipline.

How the economy works depends on its socio-institutional context. There is no theoretical reason to restrict ourselves to a dichotomy of two economic systems: socialism (or centrally planned economies) and capitalism (or market economies). For example, referring to West

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<sup>15</sup> See Pryor (1985); Wagener (1979)

<sup>16</sup> Elliott (1985)

Germany Giersch *et al.* speak of a “social market economy”.<sup>18</sup> However, empirically it makes sense to distinguish between these two economic systems. During the *cold war* the political systems of communism and democracy opposed one another and in many respects so did the economic systems that more or less correspond to the political systems.<sup>19</sup> Studies on economic systems often explicitly state the major characteristics of capitalism and socialism, and obviously East Germany is considered as a centrally planned economy and West Germany as a market economy.

The differences between the two systems may be characterised by the structure of ownership and the degree of centralisation in decision-making. West Germany, as a capitalist country, mainly relies on private and individual ownership and control of the business enterprise, whereas in East Germany, as a socialist country, state enterprises were predominant. Regarding the degree of centralisation capitalism provides wide areas of discretion for freedom of individual choice, which leads to decentralisation of economic decisions, whereas socialism shows a more centralised approach towards economic decisions.

According to Eidem and Viotti the degree of centralisation and the ownership are two ways of expressing the same phenomenon.<sup>20</sup> They argue that ownership should be analysed in terms of the bundle of rights attached to the ownership: the “property rights”, where unlimited private ownership allows the owners to use their property in any way they see fit. From this perspective the property rights define the discretion for decision-making autonomy that is attached to property.

How does the discretion for decision-making autonomy influence economic activities? To begin with it is useful to make this characteristic more concrete. It links up with theories of *economic regulation*, which can be defined as “a state-imposed limitation on the discretion that may be exercised by individuals or organisations, which is supported by the threat of sanction”.<sup>21</sup> According to Viscusi *et al.* the three key decision variables controlled by regulation are price, quantity, and the number of firms. Less frequently controlled variables include product quality and investment.<sup>22</sup> Table 1. 1 shows the actor autonomy on key decision variables in the Third Reich, in East Germany (1950 – 1989), and in West Germany. Autonomy of actors are considered to be low if the decisions are made centrally – and high if the discretion of decision-making is very much decentralised.

<sup>18</sup> Giersch, Paqué, and Schmieding (1994)

<sup>19</sup> It is sometimes argued that a country may have capitalism and democracy or capitalism and dictatorship; similarly a country may have socialism and democracy or socialism and dictatorship. See: Zimbalist and Sherman (1984) pp. 15-23

<sup>20</sup> Eidem and Viotti (1978) p. 76-79

<sup>21</sup> Alan Stone, *Regulation and Its Alternatives* (Washington 1982), as quoted in: Viscusi, Vernon, and Harrington Jr. (1992)

<sup>22</sup>

**Table 1. 1**  
**Actor autonomy on key decision variables in the**  
**Third Reich, East Germany, and West Germany**

|                 | Third Reich   | East Germany | West Germany |
|-----------------|---------------|--------------|--------------|
| Prices          | Low           | Low          | High         |
| Quantity        | Moderate      | Low          | High         |
| Number of firms | Low           | Low          | High         |
| Product quality | High/Moderate | Moderate     | High         |
| Investment      | Low           | Low          | High         |

Source: Schneider (1996)

Most of the literature on economic regulation primarily focuses on particular (regulated) industries in a dominantly 'capitalist' economy. In that sense the East German 'socialist' economy is a very extreme case of regulation, as it involves most industries. For instance, the East German producer who makes new cars had little decision autonomy on its price, quantity, and new investments. As entry and exit were up to the central government, it was not the producer's decision to stop production altogether.

Although the East German position was extreme, the decision variables that are distinguished in economic regulation provide a clear indication what kind of limitations can be put on the 'discretion of the decision-making autonomy' of actors. The effects of such limitations can be analysed in a static and in a dynamic model. In a static model that is presented by Yeager there are several necessary conditions that must be present to allow markets to function well, including good consumer information, a stable monetary system, secure property rights over the product both before and after the sale, and access to a third party system to enforce transactions.<sup>23</sup> Yeager concluded the following:

"Socialist economies satisfied these criteria. Given that there was little or no choice in product selection, consumer information was not very important. East Germany had a stable monetary system, and property rights were specified and enforced by the state. Strict enforcement mechanisms were in place to oppress reactionaries. The result was that costs of transacting were low."

In my opinion Yeager simplifies the situation too much as he makes insufficiently clear the purpose of well-functioning markets, namely to increase living standards and support allocation of resources to its most productive uses. In a centrally planned economy shortages and surpluses arise at the same time. An example by Kornai shows that the producer's aim is

to reach the targets for aggregate output set by the central planner, even at the cost of making far more green dresses and far fewer blue, far more baggy pants and far fewer tight ones than demanded by consumers.<sup>24</sup>

Despite this simplification concerning the static model, I agree with Yeager in his claim that the dynamic model is far more important. The dynamic model in Yeager is primarily based on the Schumpeterian concept of 'creative destruction'. Yeager wrote: "For intensive growth to occur, institutions must foster the process of creative destruction in which new technology destroys the old. This requires supply-side competition and profit-seeking behaviour. Socialist economies, by their very nature, do not promote competition".<sup>25</sup>

Whether socialist economies did or did not promote competition should be encountered with caution. Stiglitz already emphasised that the term 'competition' has a variety of meanings.<sup>26</sup> In the literature it has been argued that under communism there was a fierce competition between individual enterprises competing with each other for resources. Investment goods and different inputs necessary for production were allocated administratively and were scarce. Therefore state-owned enterprises had to compete with each other, most often in the process of increasingly multilateral bargaining, to force central planners to give them as much as possible (and demand as little as possible).<sup>27</sup> Therefore I think that the main difference is what the competition between firms is about rather than whether it is apparent. There is a point, however, whether competition was 'creative': whether it supported technological change, whether it satisfied demand and raised living standards, and whether it helped to allocate resources to its most productive use as to reduce potential wealth losses.

#### *A dynamic model: factor reallocation*

Schumpeter starts his narrative on the process of creative destruction stating that capitalism never is and never can be stationary. He discerns that the new consumer goods, new methods of production or transportation, new markets, new forms of industrial organisation incessantly revolutionises the economic structure from within, incessantly destroying the old one, incessantly creating a new one. This process he calls creative destruction.

It is a dynamic model for a society where a decentralised discretion for freedom of individual choice prevails. The introduction of a new commodity, a new technology or a new type of organisation involves concrete decisions. In a market economy there are several actors who

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<sup>24</sup> Kornai (1992) p. 271

<sup>25</sup> Yeager (1999) p. 72; see also Schumpeter (1961)

<sup>26</sup> Stiglitz (1994) pp. 109-138

may decide upon these issues, using their own (accesses to) means, and carrying their own gains and losses. Obviously profitable decisions might generate money, and therefore increase future means to effectuate new decisions. At the same time future means might be reduced due to unprofitable decisions. Consequently the relative positions of the different actors (firms) are repeatedly re-established, in other words they lead to a continuous reallocation of resources.

For each enterprise past decisions have effects on 'current' means. At the micro level of firms – where the process of creative destruction takes place – factors shift towards the most successful firms. Hence much of this reallocation reflects within-sector rather than between sector-reallocation. But even between sectors shifts of labour and capital from less productive to more productive sectors can accelerate growth.<sup>28</sup>

What can be expected of factor reallocation in a country where decision-making is centralised? In a centrally planned economy the central government sets production targets, allocates resources, and bears the risks. Because firms neither get the gains nor bear the risks there is no clear relationship between past-decisions and current means. The lacking relationship between past-decisions and current means is best described in Kornai: "What happens under the classical socialist system if a state-owned firm's spending exceeds its budget constraint? And what happens if this is a regular, not an isolated, occurrence? The observation then is that the constraint will be adjusted to the repeated overspending. The firm receives regular external assistance".<sup>29</sup> In the socialist system firms had soft budget constraints: to increase their budget they had to negotiate with the regime.

Due to the soft budget constraints inefficient firms could stay in business. Their losses could be compensated for through bargaining on (structural) state subsidies, lower taxation, favourable credits, or new (administrative) prices. Moreover, "soft budget constraints generated excess demand, unsatisfied (and unsatisfiable!) excess demand generated shortages, shortages aggravated supply uncertainty and – in order to insure themselves against late or missing deliveries – enterprises tried to hold as large input inventories as possible". The centrally planned economy produced "output that existed but should not".<sup>30</sup> Meanwhile the reallocation process is to a large extent the domain of politics. The system depended on the grants of the regime, which makes it a matter of political decision-making. Whereas in the decentralised model the economic structure changes 'from within', in the centralised model it

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<sup>27</sup> Jasiński and Ross (1999) pp 195, 196

<sup>28</sup> Chenery, Robinson and Syrquin (1986) p. 13; Foster, Haltiwanger and Krizan (1998)

<sup>29</sup> Kornai (1992) pp. 140 ff.

<sup>30</sup> Winiński (2002); Literature recognises 'output that existed but should not' and also 'output that did not exist'. The latter refers to the earlier mentioned distrust in the East German statistics and will be discussed in Chapter 6

changes 'from above'. To understand the transformation of the East German economic structure it is therefore useful to examine the policy of the regime. What were the policy aims?

Firstly it was to some extent necessary to meet the demand of the consumers. According to Kopstein the East German population mirrored itself to West Germany, and thus demanded western living standards. Especially before the building of the Berlin Wall in 1961, when East German people could migrate relatively easy towards West Germany, this was important. For instance in 1958, Ulbricht declared that the chief economic task was overtaking West Germany in per capita consumption of all important food items and consumer goods by 1961.<sup>31</sup> Above, Kornai's example of green and blue dresses (baggy and tight pants) made clear that the regime did not manage to produce the proper amount of each category. While failing to satisfy consumer demand and raise utility and living standards, the firms mainly aimed to reach the production target. At the same time the example shows that the regime did bother enough to produce both colours of dresses and both types of pants.

Secondly East German employment policy set ambitious goals. In East Germany the people had a right to get a job (also there was an obligatory regulation for people who refused to work). It was the aim to establish full employment, and indeed official unemployment was almost absent. Even (partly) disabled persons were integrated in the labour process. The result of this social policy is that in addition to holding large inventories, firms also hoarded labour adding to their slowing productivity growth.<sup>32</sup> With hard budget constraints unemployment would have risen in East Germany. Therefore the budget grants the regime gave to the firms are in part related to labour market policy.

Thirdly it was important to satisfy the economic-political aims of the Soviet bloc. This is illustrated by the building of heavy industries – iron and steel – in *Eisenhüttenstadt* near the Polish border. This new industrial centre fitted into the pattern of 'socialist industrialisation', where according to the Soviet example an industrial structure was developed with a focus on heavy industries.<sup>33</sup> From an efficiency viewpoint it would have been more sensible to build these industries in Rostock, so that Swedish iron ore could be used. However, the location in Rostock was undesired by the Soviet Union – and the alternative of *Eisenhüttenstadt* made the East German industries much more dependent on Soviet ores.<sup>34</sup>

<sup>31</sup> Kopstein (1997) p. 43, 44

<sup>32</sup> Hoffmann (2002) p. 115

<sup>33</sup> Schultz (1999)

### *A dynamic model II: innovation systems*

New technology is regarded as a main driving force for productivity growth. It is claimed that the centralised or the decentralised organisation design do not only influence the process of factor allocation, but also the introduction of new technologies. Fritsch and Werker observed three main differences between innovation systems in centrally planned economies and innovation systems in market economies.<sup>35</sup>

Firstly the centralised innovation system, especially in East Germany, uses a linear innovation model that distinguishes the logical steps of the innovation process, i.e. invention, development, innovation and diffusion. These phases had to be passed successively one after another. The linear model was less widely applied in the decentralised innovation system, mainly because the model largely neglects a feedback process: what about the effects of consumers' preferences on the research activities?

Secondly the centralised system lacks a clear relationship between successful innovations and future resources. This links up with the previous section, where it was argued that in the decentralised system gains and losses are allocated corresponding to the firm that actually made the decision. Fritsch and Werker state that the lacking relationship between successful innovations and future resources leads to relatively weak incentives to generate innovations in the centralised system. This also links up with Gomulka, who finds that the severe limitations in the freedom of decision-making and resource reallocation lead to weak innovation incentives.<sup>36</sup> According to Gomulka in a centrally planned economy the main motivation for innovating firms is the need to overcome supply difficulties.

As a result process innovations rather than product innovations tend to dominate, i.e. the use of different intermediate inputs for making the same product. For East Germany this can be illustrated with the example of the 'basic and fabricated metal products' branch. After the Second World War this branch faced difficulties in retrieving the necessary inputs, which were produced insufficiently by East German mining. Hence the firms were motivated to overcome supply difficulties. The bottlenecks were solved by the use of alternative inputs, especially (metal) scrap.<sup>37</sup> But on the side of product innovations, 'new products' remained limited to variations on the same product.

Thirdly the "centralised" innovation decision was based on what they believed to be the most promising technological path. As a result there was little variety of alternative technologies.

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<sup>34</sup> Gayko (2000)

<sup>35</sup> Fritsch and Brezinski eds. (1999)

<sup>36</sup> Gomulka (1986) pp. 42-61

Whereas the communist regime regarded redundancy of innovation activities mainly as an unnecessary waste of resources, there are also major drawbacks. Fritsch and Werker mention the following:

- In cases where decisions for technological paths turn out to be wrong alternative technologies were not readily available;
- The relatively poor variety of technology options could result in difficulties if the environmental conditions changed and technologies that were inferior in the short-run could provide important solutions;
- A lack of variety implies only very limited opportunities for competition between different solutions in order to discover the best alternative.

In a cynical view of Bentley, espionage in Western countries by East Germany's secret service was an important channel of the latest developments in technology.<sup>38</sup> Bentley distinguishes three phases in the East German technological history. From 1945 to 1962 the decision-making on innovation and diffusion was centralised. According to Bentley the central plans for new technology tended to be less the result of active project selection than simply a compilation of proposals from below. From 1963 to 1971 the decision-making was becoming more decentralised. This coincides with the introduction of the *new economic system* in East Germany between 1963 and 1967. Although this concept promised theoretically to stimulate industrial innovation and diffusion more efficiently than before, it was not allowed very long to prove itself. From 1971 onwards management of the economy was recentralised.

#### **1.4 Transformation and unification**

After 1989 East Germany was transformed from a centrally planned economy into a market economy and in 1990 East and West Germany (re) unified. As was the case with the period before the division of Germany, the period after unification provides a second anchor for the years that the two 'Germanies' were separated (1950-1990). Moreover, after the shock effect of unification had petered the East German economy seemed in worse condition than before. Why did transition at first lead to crisis? How well did the East German economy do after 1991? And what are the future prospects?

During the transformation from a centrally planned economy to a market economy the soft budget constraints were replaced by hard budget constraints. Firms that were held in business

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<sup>37</sup> Mühlfriedel and Wießner (1989) pp. 245-258; Unger (2000) pp. 147-169

through aid of the regime had to close down. The demand for large inventories disappeared. In short: the economy got rid of 'output that existed but should not'.<sup>39</sup> However, different processes were set into motion simultaneously. Besides the transformation of the economic system, the East German economy integrated into the West German (and the West European) market, and politically the two German states unified. It is not so easy to separate the transformation to a market economy from other processes. The East German experience does not only show the effects of a change from a centrally planned economy to a market economy. It also shows the readiness of East German firms to compete on the new German market.

Transformation improved the autonomy of firms in decision-making on prices, quantity, quality and investment. The introduction of West German market based institutions changed what competition was about: rather than the favour of central planners, firms were now primarily interested in the favour of consumers. However, unification gave firms little time to adapt to the new institutional environment. The integration of the East and West German markets brought all kinds of new (West German) products to East Germany. Whereas the East German economy was under massive reconstruction, the struggle for market shares had already started.

Transformation and unification refers to processes related to a shift from a centrally planned economy, but also to processes related to the integration of markets. During these changes the East German economy was supported to invest in a modernisation of the existing capital stock and also to improve its infrastructure through financial transfers from West Germany to East Germany.

Convergence of the East German economy, in particular of East German labour productivity, to West German levels is a dominant theme in the literature of the past decade. When will East Germany catch up with the West German level? Estimates vary from about 2060 by Barro and Sala-i-Martin<sup>40</sup>, to somewhere between 2003 and 2010 by Burda.<sup>41</sup> The convergence hypothesis states that the existence of a technological gap points at an extra growth potential.<sup>42</sup> If followers are able to imitate superior technology, they can catch-up to the leader. In the case of the two German economies this means that East Germany should adopt those technologies that are already used in the (more advanced) West German economy.

In order to do so, there is need for technical congruence. That is a compatibility of the natural resource endowment and the market size of a country on the one hand, and the characteristics of the technologies to be adapted on the other hand. Furthermore a country needs the ability to

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<sup>39</sup> Winiecki (2002)

<sup>40</sup> Barro and Sala-i-Martin (1991)

<sup>41</sup> Burda (1995)

assimilate advanced countries technology effectively, i.e. “social capability”.<sup>43</sup> Social capability can be defined as a set of requirements: adequate levels of human capital; appropriate institutions; openness; and a political system that does not block reform or impede innovative activity.<sup>44</sup> After the transition between 1989 and 1991 East Germany fulfilled these requirements. Transition provided East Germany of adequate institutions, openness and the required political system. Levels of human capital are usually seen as good, so that superior technology might be successfully implemented.<sup>45</sup>

Social capability is a necessary condition for catch-up. It does not automatically imply that if East Germany adopts new – superior – technologies it will converge to the West German level of labour productivity. This is particularly stressed by Fremdling, who stated that what is superior technologically need not be superior economically.<sup>46</sup> Since convergence levelled off after 1995, more attention is paid to the question whether East Germany will catch-up at all. In a study of Boltho, Carlin and Scaramozzino, East Germany was compared with Mezzogiorno (Southern Italy), a region that did not converge to Northern Italian levels. They concluded that given East Germany’s great *social capability* for growth, and provided that investment continues to be encouraged, the prospects for convergence are more promising in East Germany than for Mezzogiorno.<sup>47</sup>

More recently, Sinn and Westermann concluded that East Germany faces the Mezzogiorno scenario. They rejected the convergence hypothesis and observe a drifting away.<sup>48</sup> East Germany is located at the outskirts of the European Union, lacks adequate quality of the local infrastructure, has – therefore – a location disadvantage. Due to the integration of the East and West German markets the core and the peripheries are new defined. Location preferences are as important as access to technological knowledge, and may be decisive in matters of convergence.

In other words, the expectations based on transformation (i.e. convergence) may have done their job for some years but nowadays processes that were initiated by the unification and the integration of markets (i.e. location theories) prevent a further catching up. Support for this idea is also found in Brakman, Garretsen and Schramm, who concluded that relocation of industries to the core (West Germany) was strongest for industries with the strongest

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<sup>42</sup> Gerschenkron (1962)

<sup>43</sup> Abramovitz (1989)

<sup>44</sup> Crafts (2000)

<sup>45</sup> It is noted that some authors are critical with regard to East German skill levels; see Hitchens, Wagner and Birnie (1993)

<sup>46</sup> Fremdling (1990)

<sup>47</sup> Boltho, Carlin and Scaramozzino (1997)

<sup>48</sup>

economies of scale.<sup>49</sup> This thesis will discuss the effects of intertemporal transformation and spatial integration for the transition between 1989 and 1991, and also for the period thereafter in Chapter 5.

## 1.5 Outline

This thesis aims to explain the divergence of the East and West German economies between 1936 and 1991. How much and when did East Germany fall behind the west, and what were the main causes? For this purpose I distinguish the initial conditions, the growth performance from 1950 to 1989, as well as the unification of the two economies in 1990. A follow up question that will be examined concerns convergence of the East German economy to West Germany between 1991 and 2002, as well as prospects for further convergence thereafter.

Important innovations in this study are new time series for the total economy, as well as for some of the underlying sectors and manufacturing branches. It presents two new estimates for the relative level of labour productivity in the industrial sector of 1936 and 1954, again split up for manufacturing branches.

The analysis in this thesis is very much oriented towards quantitative approaches and methods, as can be seen in the short introduction to the chapters below. After starting with an overview for the entire period from 1936 to 2000, Chapter 2 deals with the East German growth performance from 1950 to 1989 in comparison with West Germany of the total economy. The main argument is that the observed East German performance based on Gross Domestic Product (GDP) per capita hides underlying problems of the East German economy that become apparent when looking at GDP per person employed. Developments of main sectors of the economy are discussed in some detail.

Chapter 3 analyses the effects of the initial hardship on the relative level of labour productivity in the case of the industrial sector. The analysis includes two benchmark comparisons (1936 and 1954) that differentiate for the major industrial branches, which provides information on the East and West German economic structure and also on structural changes between 1936 and 1954. Labour productivity does not only differ between sectors and branches, but also between regions. Therefore the analysis of the initial conditions in Chapter 3 includes a comparison of the labour productivity performance of East and West German regions before and after separation.

I examine the East German growth performance in the industrial sector in Chapter 4. This chapter first compares the comparative performance of labour productivity in industry and manufacturing (industries, except mining) in East Germany and West Germany. A main question is: how did structural change contribute to economic growth? Based on the different economic systems that prevailed, structural change is expected to contribute less to economic growth in East Germany than in West Germany. Another issue related to differences between capitalism and communism is the quality of products. Whereas East German producers aimed to meet the production targets, West German producers wanted to reach the consumer. As a result quality differences may be expected. Therefore I will also compare the quality of East and West German products.

Transformation and unification did not only release processes related to a shift from a centrally planned economy to a market economy, but also processes related to the integration of markets. Chapter 5 looks at the economic development from 1989 to 2000. It aims to explain the collapse of the East German economy between 1989 and 1991, and it indicates the probability of convergence to West German levels of labour productivity in the near future.

Many of the official East German statistics, i.e. the statistics of the German Democratic Republic, have been criticised for lacking reliability and lacking comparability with western statistics. Chapter 6 discusses backgrounds to the East German statistics in general, to the data that were used in this research in particular, and also the main alternatives provided in the literature.

## Chapter 7

### Concluding chapter:

#### **Institutions, historical events and the development of the East German economy in comparison with West Germany**

This thesis compares the East and West German economies from 1936 to 2002, and in particular the period from 1936 to 1991. During these years the East German economy fell behind the West German level in terms of gross domestic product per capita – and also in terms of labour productivity. When did the once relatively prosperous and high productive East German economy lose track of West Germany? What were the causes?

From 1949 until 1989 the two German economies were separate countries with different *economic systems*: East Germany, the GDR, was a ‘centrally planned economy’ and West Germany, the FRG, was a ‘market economy’. Therefore the influence of institutions on economic performance is a major theme in the comparison of the East- and West German economies. Besides the effects of institutional differences the falling behind is also related to the historical events between 1936 and 1950. The economies were harmed by the Second World War and the beginning of the ‘cold war’ through war damage, dismantling, reparations, migration, and the disintegration of Germany. Finally the historical events between 1989 and 1991, including the fall of the Berlin Wall, East Germany’s transformation to a market economy and the integration of the East- and West German markets, contributed to the East German falling behind.

Therefore the analysis distinguishes between three sub-periods of the East German falling behind: (a) from 1936 to 1950, (b) from 1950 to 1989, and (c) from 1989 to 1991. Thereafter East Germany was catching up relative to West Germany.

#### *Falling behind from 1936 to 1950*

In 1936 East German gross domestic product per capita was above the West German level, in 1950 it was about 56 per cent of West Germany. Relative levels of labour productivity worsened in agriculture, manufacturing, construction, and in transports and communication. In mining there was no falling behind. Confined to the industrial sector – which comprises

manufacturing and mining – there was a drastic fall of output in the final years of the Second World War. On balance the East German industrial output declined between the benchmark years 1936 and 1950. In West Germany there was still some growth of industrial output in this period.

The East German and West German growth of industrial output were analysed in a growth accounting framework. This framework explains output growth by changes of labour inputs, capital inputs and total factor productivity. It appeared that the main explanation for the decline of industrial output in East Germany lies in capital inputs. East Germany suffered from war damage and dismantling by the Soviet Union. Whereas war damage was more or less the same in the two German economies, dismantling made the East German balance sheet unfavourable in comparison with West Germany.

Furthermore the Soviet Union demanded for reparations. It is argued that reparations, which mainly concerned deliveries out of current production, had indirect effects on the East German capital stock. Reparations put a heavy burden on national income, so that possibilities for investment were sharply reduced. In addition low investment also relates to the institutional change towards a centrally planned economy, which involved expropriations, and thus created a bad investment climate.

Besides a decrease of the capital stock also negative total factor productivity explains for the decline of industrial output in East Germany. After the separation of the two German economies the existing patterns of specialisation were cut loose. Some industries were still dependent on deliveries from West German firms; the division of Germany created bottlenecks in East Germany. Other explanations for the negative total factor productivity include the outflow of human capital towards West Germany and the inferior technology – in terms of efficiency – of the new industrial centre that was built in East Germany during the Second World War. It is noted that labour inputs increased during this period, which relates to the enormous migration towards both East- and West Germany from the lost provinces of Pommerania, Silesia, and East Prussia, and of ethnic Germans from all over Eastern Europe.

Before the Second World War labour productivity in the East German industrial sector was already below the West German level, albeit merely 9 per cent. At that time there was a division of labour where the branch 'basic and fabricated metal' was relatively large in West Germany and the branch 'textiles, wearing apparel' was large in East Germany. Looking at the technology regimes during which different industries came into development, this suggests that the West German industry structure was more modern. After the division of Germany the branch 'metal, machinery and transports' explained for most of the difference of East German and West German industrial labour productivity.

### *Falling behind from 1950 to 1989*

From 1950 to 1989 the observed performance based on gross domestic product per capita hides underlying problems of the East German economy that become apparent when looking at gross domestic product per worker. Whereas the East German gross domestic product per capita remained at about 56 per cent of the West German level, the East German labour productivity declined in comparison with West Germany since 1950. This combination is marked by a high participation of labour – defined as the number of workers in per cent of the population – in East Germany.

The increase of labour productivity between 1950 and 1989 was relatively low within the East German sectors, in particular in agriculture. Meanwhile East German construction achieved a similar growth of labour productivity as in West Germany. To explain for these developments several issues are taken into account. Firstly technological improvements – or the lack of them – can explain for labour productivity growth. In East German agriculture this may refer to the few amounts of milking machines, in the construction sector the East German *plattenbau* allowed for very efficient production. Secondly labour productivity may increase through the use of capital instead of labour. Thirdly the composition of what was produced within a sector changed over time and was different between East Germany and West Germany. For instance: agriculture produced crops and livestock products, mining includes black coal, brown coal and iron ores, construction includes housing and industrial structures, etceteras. A shift in the composition of a sector may increase labour productivity.

Similarly the reallocation of factors between sectors can improve labour productivity. In both German economies labour moved out of sectors with a low productivity *level* (e.g. agriculture) and into sectors with a higher productivity level (e.g. manufacturing). This helped to increase the aggregate level of labour productivity. In the case of East Germany it is observed that factor reallocation is dynamic, there is a huge shift of labour inputs towards sectors with higher labour productivity *growth*. This might be related to the system of economic planning where resources for investment in capital and technology – leading to higher productivity growth – and labour inputs are directed into the same sectors of the economy.

Looking in more detail at the industrial sector – where 12 branches are distinguished – one may expect a similar pattern. East Germany focussed on some particular priority sectors, which could easily lead to dynamic shift effects. Moreover, central planning policy might induce crowding out effects of non-priority sectors that received difficulties to get finance for investment and to get employees. However, these patterns were not observed. Decomposition into the contribution of labour and capital to the growth of industrial production is not possible

Germany, using Harberger diagrams, showed that during the 1950s and 1960s labour productivity expanded evenly across branches. For the 1950s, when there was a clear focus on heavy industries, this suggests that the expansion of 'basic and fabricated metal' could set free other branches that were suffering from bottlenecks.

Only in the 1970s there was a large overshooting with a negative contribution to the total industrial labour productivity growth by 'mining' and 'machinery and transports'. The examples of the imports-dependent chemical industries (crude oil) and the exports-oriented machinery industries showed that these findings are consistent with the changing position of East Germany in the international context. The very low growth of industrial labour productivity in the 1980s troubles the decomposition analysis. Based on findings in the literature it was related to lacking modern technologies which enable to increase labour productivity; and also to existing institutions that prohibited the increase of labour productivity through rationalisation, as everyone had the right to get a job.

#### *Falling behind from 1989 to 1991*

Gross domestic product per capita had remained at a stable distance of West Germany throughout the period from 1950 to 1989, with little falling behind during the 1980s, thereafter the East German gross domestic product per capita collapsed. As a centrally planned economy could maintain a standard of living at 56 per cent of the West German level through high labour efforts, which were manifested in the participation of women in the workforce and in the hours worked. When the East German economy transformed in a market economy some typical 'socialist production' was no longer continued. This refers to production that could only exist from the distorted demand structure in socialist economies such as purchases that existed because of a lack of alternatives (textiles), excessive purchases in inventories and also the hoarding of food that followed irregular supply. The institutional change led to a drastic fall of output, so that gross domestic product per capita faded.

Labour productivity also declined. Even though the less efficient firms were closed down in general output decreased faster than the amount of labour inputs did. Besides the transformation of the East German economic system it is also recognised that the East German economy integrated with West Germany. Much of the East German demand shifted from domestic products to products of Western origin from the removal of travel restrictions onwards.

The East German firms faced decreasing revenues due to lagging demand and downward

setting of the social union led to high wages. East German firms experienced a profit squeeze, sometimes alleviated by an improved input output ratio, sometimes worsened by the new input output relationship. Besides transformation also the integration of the two economies contributed to the falling behind of the East German economy between 1989 and 1991.

### *Catching up since 1991*

Since East Germany adopted the institutions of a market economy, and it engaged into unification with the technologically advanced economy of West Germany, high growth rates and a convergence to West German levels could be expected. Especially now that investment in East Germany is at a high level. In comparison with other former centrally planned economies in Eastern Europe the convergence of manufacturing labour productivity in East Germany has indeed been impressive.

Meanwhile convergence has levelled off, and is in fact concentrated in an impressive spurt from 1991 to 1994. Increasingly the question arises whether East Germany will converge any further at all. Especially the emergence of a different structure of the economy in the two parts of Germany and the falling behind of East German public utilities, construction, and trade raise doubts.

It is found that the East German economy is relatively strong developed in sectors where the factor endowment land is important, such as agriculture and construction. This relates to the relatively low prices for land in East Germany. Furthermore the manufacturing sector is remarkably weak developed. This could be explained by the integration of the two German economies – where the spatial issue of core and periphery were newly defined – which supposedly made East Germany a peripheral region within the united German economy.

Therefore it is unlikely that East Germany will attain a level of labour productivity as high as in West Germany. In comparison with West Germany the East German economy has a negative structure effect (some very high productive sectors are located in West Germany) and also lacks the beneficial effects of 'economies of scale'. Within the West German core regions large size enterprises occur, and are able to realise a relatively high labour productivity.

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### Annex A. 1 Industrial production from 1936 to 1954

Gross output series for this period are based on several sources. As it was not always possible to separate out developments in East and West Germany, movements from 1936 to 1939 and 1939 to 1944 were based on interpolations. For 1936, 1939, and all years from 1944 onwards there are specific estimates for the two parts of Germany, albeit that the estimate for 1945 merely refers to the last quarter of that year.

|      | East Germany |              |                  |         | West Germany |                  |         |         | Strat.<br>Bomb.<br>Survey |
|------|--------------|--------------|------------------|---------|--------------|------------------|---------|---------|---------------------------|
|      |              | Annex<br>A.3 | Abels-<br>hauser | Gleitze |              | Abels-<br>hauser | Stolper | Gleitze |                           |
| 1936 | 100          | 100          | 100              | 100     | 100          | 100              | 100     | 100     |                           |
| 1937 | 112          |              |                  |         | 108          |                  |         |         |                           |
| 1938 | 124          |              |                  |         | 115          |                  |         |         |                           |
| 1939 | 137          |              |                  | 137     | 123          |                  | 123     | 123     | 100                       |
| 1940 | 139          |              |                  |         | 124          |                  |         |         | 107                       |
| 1941 | 141          |              |                  |         | 126          |                  |         |         | 117                       |
| 1942 | 141          |              |                  |         | 126          |                  |         |         | 118                       |
| 1943 | 145          |              |                  |         | 129          |                  |         |         | 132                       |
| 1944 | 145          |              |                  | 145     | 129          |                  |         | 129     | 133                       |
| 1945 | 22           |              | 22               |         | 21           | 21               |         |         |                           |
| 1946 | 44           | 35           | 44               |         | 37           | 37               |         |         |                           |
| 1947 | 54           |              | 54               |         | 44           | 44               |         |         |                           |
| 1948 | 60           | 49           | 60               |         | 61           | 61               |         |         |                           |
| 1949 | 68           |              | 68               |         | 83           | 83               |         |         |                           |
| 1950 | 75           | 75           |                  |         | 113          |                  | 113     |         |                           |
| 1951 | 87           | 87           |                  |         | 134          |                  | 134     |         |                           |
| 1952 | 96           | 96           |                  |         | 144          |                  | 144     |         |                           |
| 1953 | 106          | 106          |                  |         | 157          |                  | 157     |         |                           |
| 1954 | 117          | 117          |                  |         | 176          |                  | 176     |         |                           |

Sources: Annex A. 3; Werner Abelshauser, *Wirtschaftsgeschichte der Bundesrepublik Deutschland 1945-1980* (Frankfurt/M 1983); Bruno Gleitze, *Ostdeutsche Wirtschaft. Industrielle Standorte und volkswirtschaftliche Kapazitäten des ungeteilten Deutschland* (Berlin 1956); Wolfgang F. Stolper, *The Structure of the East German Economy* (Cambridge 1960); Overall Economic Effects Division, *The United States Strategic Bombing Survey: The Effects of Strategic Bombing on the German War Economy* (xx 1945)

From 1936 to 1944 the series for both parts of Germany are based on the estimates of Gleitze (p. 173) for 1936, 1939 and 1944. Interpolation between 1936 and 1939 is linear, and between 1939 and 1944 in proportion to the overall production increase in Germany according to the "Strategic Bombing Survey" (p. 27) as shown in the last column. Series for 1945 to 1949 are from Abelshauser (p. 34). It is noted that the estimate for 1945 is based on the last quarter, and 1949 is based on the first and the second quarter of that year.

West German series from 1950 onwards link up directly to 1936, and were derived from Stolper (p. 242). East German series also link up directly to 1936, and are based on Annex A. 3 in this study. Because the sample of my series is very small in 1946 and 1948, I decided to ignore the results for these specific years.

## Annex A. 2

### Industrial employment and capital stock (1936 – 1954)

In view of the available data the statistics on employment for the period from 1936 to 1954 can be divided into two sub-periods: from 1936 to 1944, and from 1945 onwards. Data on the first period is based on the absolute number of employed persons in the industrial sectors in each of the countries in 1936 and in 1939. These were obtained from Annex C. 1 and from Bruno Gleitze, *Ostdeutsche Wirtschaft. Industrielle Standorte und volkswirtschaftliche Kapazitäten des ungeteilten Deutschland* (Berlin 1956). Ultimately the estimate for 1936 (Annex C. 1) was based on the “industrielle Produktionsstatistik”, whereas the estimate for 1939 (Gleitze) is based on the “gewerblichen Betriebszählungen”. Different coverage in these two sources harm the continuity of the series between 1938 and 1939. See also: Reichsamt für wehrwirtschaftliche Planung, *Die deutsche Industrie* (Berlin 1939) pp. 56 ff. The other years in the sub-period from 1936 to 1944 were estimated from statistics on industrial employment in all Germany according to the frontiers of 1937 as was found in Länderrat des Amerikanischen Besatzungsgebiets, *Statistisches Handbuch von Deutschland 1928 – 1944* (München 1949) on pp. 480, 481. This makes the estimates for this period very rough; however, I did not use these statistics in the analysis of this thesis otherwise than to give an indication that negative East German TFP between 1936 and 1950 was mainly due to the postwar period. At the end of this Annex a sensitivity test shows that this finding holds.

|      | Employment   |              | Capital Stock |              |
|------|--------------|--------------|---------------|--------------|
|      | East Germany | West Germany | East Germany  | West Germany |
| 1936 | 100          | 100          | 100           | 100          |
| 1937 | 105          | 105          |               |              |
| 1938 | 108          | 109          |               |              |
| 1939 | 135          | 136          |               |              |
| 1940 | 128          | 128          |               |              |
| 1941 | 130          | 131          |               |              |
| 1942 | 128          | 128          |               |              |
| 1943 | 135          | 136          |               |              |
| 1944 | 134          | 135          | 138           | 136          |
| 1945 | 81           |              |               |              |
| 1946 | 108          |              |               |              |
| 1947 | 116          |              |               |              |
| 1948 | 120          | 114          | 69            | 113          |
| 1949 | 119          | 115          |               |              |
| 1950 | 118          | 121          | 72            | 122          |
| 1951 | 127          | 130          |               |              |
| 1952 | 133          | 134          |               |              |
| 1953 | 137          | 141          |               |              |
| 1954 | 139          | 148          |               |              |

West German statistics on employment from 1950 onwards were derived from Statistisches Bundesamt, *Volkswirtschaftliche Gesamtrechnungen Fachserie 18, Reihe S. 15 Revidierte Ergebnisse 1950 bis 1990* (Wiesbaden 1991) p. 89. Unfortunately the statistics do not separate out construction and industrial employment for the 1950s. To link up with 1936 it was assumed that 17 percent of the employment in the “Produzierendes Gewerbe” belonged to construction. Estimates on West German employment in 1948 and 1949 are based on Werner Abelshauser, *Wirtschaftsgeschichte der Bundesrepublik Deutschland 1945-1980* (Frankfurt/M 1983) p. 64. It is noted that these two years were linked to 1950 and based on employment in the third quarter of 1948, 1949 and 1950.

East German statistics on employment from 1950 onwards are described in more detail in Annex A. 4. Estimates on East German employment in 1945, 1946, 1947, 1948 and 1949 are based on Bruno Gleitze, *Die Wirtschaftsstruktur der Sowjetzone und ihre gegenwärtigen sozial- und wirtschaftsrechtlichen Tendenzen* (Bonn 1951). Gleitze, who had been the director of the East German statistical office in the 1940s before he migrated to West Germany, gives statistics on total employment from 1945 to 1950 and of the industrial structure (pp. 11, 12). Thus it was possible to get a view on the movement of industrial employment, which was linked to the 1950 estimate in Annex A. 4.

The estimates for the industrial capital stock were based on the gross perpetual inventory relation. They refer to machinery, equipment and buildings and the development is estimated looking at the gross capital stock at the beginning of the year plus the gross fixed capital formation during the year minus the retirements during the year. The West German capital stock was completely derived from Rolf Krengel, *Anlagevermögen, Produktion und Beschäftigung der Industrie im Gebiet der Bundesrepublik von 1924 bis 1956* (Berlin 1956). The East German capital stock data primarily relies on Baar, Lothar, Rainer Karlsch, Werner Matschke, "Kriegsschäden, Demontagen und Reparationen" in: Enquete-Kommission 'Aufarbeitung von Geschichte und Folgen der SED-Diktatur in Deutschland', *Machtstrukturen und Entscheidungsmechanismen im SED-Staat und die Frage der Verantwortung* (Frankfurt/M 1995) p. 915. They estimated the East German capital stock in 1936 and 1948, using material from the archives. The estimate for 1944 is shown in Zank, *Wirtschaft und Arbeit in Ostdeutschland 1945-1949: Probleme des Wiederaufbaus in der Sowjetischen Besatzungszone Deutschlands* (Munich 1987). Finally I estimated the East German capital stock in 1950, extrapolating the above mentioned estimate for 1948 with timeseries of Manfred Melzer, *Anlagevermögen, Produktion und Beschäftigung der Industrie im Gebiet der DDR von 1936 bis 1978 sowie Schätzung des künftigen Angebotspotentials* (Berlin 1980). The timeseries of Melzer are also based on the perpetual inventory method. The estimates for retirements are based on information on the inventory during the 1960s when the new economic system was introduced, and also on West German retirements (average service lives) as were found in the research of Krengel.

#### **Sensitivity of East German TFP from 1936 – 1944 for different developments of labour inputs**

|                                                         |          |
|---------------------------------------------------------|----------|
| "Actual" index number for labour inputs (134) leads to: | TFP: 0.4 |
| Lower index number for labour inputs (108) leads to:    | TFP: 1.1 |
| Higher index number for labour inputs (150) leads to:   | TFP: 0.1 |

### Annex A. 3 Industrial production from 1950 to 1992

| Year | Total | (Utilities) | Mining | Food | Textiles | Leather | Wood | Paper | Chem | Stone | Metal | Mach | Electr | Optics |
|------|-------|-------------|--------|------|----------|---------|------|-------|------|-------|-------|------|--------|--------|
| 1936 | 205   | 71          | 72     | 133  | 107      | 190     |      | 183   | 77   | 172   | 198   | 582  | 123    | 396    |
| 1946 |       | 58          | 78     | 73   | 39       | 57      |      | 63    | 20   | 37    | 34    | 14   |        |        |
| 1948 |       | 72          | 80     | 93   | 55       | 62      |      | 72    | 59   | 60    | 63    | 34   | 8      | 59     |
| 1950 | 100   | 100         | 100    | 100  | 100      | 100     | 100  | 100   | 100  | 100   | 100   | 100  | 100    | 100    |
| 1951 | 114   | 111         | 110    | 138  | 123      | 120     | 89   | 111   | 108  | 116   | 120   | 109  | 123    | 86     |
| 1952 | 124   | 119         | 115    | 162  | 137      | 133     | 77   | 122   | 121  | 126   | 151   | 106  | 127    | 97     |
| 1953 | 141   | 125         | 125    | 190  | 151      | 145     | 79   | 132   | 131  | 133   | 174   | 139  | 124    | 97     |
| 1954 | 157   | 136         | 131    | 197  | 166      | 148     | 79   | 137   | 142  | 145   | 190   | 180  | 175    | 116    |
| 1955 | 167   | 149         | 143    | 207  | 167      | 136     | 76   | 144   | 157  | 163   | 200   | 200  | 201    | 133    |
| 1956 | 175   | 163         | 146    | 213  | 166      | 125     | 75   | 148   | 166  | 173   | 216   | 216  | 235    | 100    |
| 1957 | 183   | 170         | 150    | 227  | 173      | 131     | 73   | 154   | 172  | 189   | 231   | 213  | 274    | 97     |
| 1958 | 189   | 183         | 152    | 234  | 179      | 149     | 75   | 160   | 181  | 198   | 242   | 212  | 310    | 86     |
| 1959 | 206   | 194         | 153    | 238  | 194      | 171     | 77   | 169   | 187  | 221   | 261   | 259  | 352    | 89     |
| 1960 | 217   | 207         | 159    | 247  | 203      | 189     | 78   | 174   | 199  | 233   | 272   | 274  | 409    | 92     |
| 1961 | 221   | 219         | 165    | 251  | 204      | 188     | 76   | 178   | 197  | 235   | 284   | 281  | 412    | 77     |
| 1962 | 230   | 232         | 170    | 246  | 209      | 188     | 74   | 184   | 207  | 249   | 293   | 312  | 448    | 85     |
| 1963 | 232   | 243         | 172    | 255  | 208      | 186     | 67   | 185   | 215  | 241   | 288   | 313  | 517    | 87     |
| 1964 | 238   | 256         | 175    | 263  | 208      | 197     | 62   | 192   | 224  | 260   | 293   | 324  | 523    | 86     |
| 1965 | 240   | 269         | 171    | 261  | 212      | 207     | 63   | 197   | 256  | 266   | 307   | 300  | 518    | 87     |
| 1966 | 244   | 284         | 169    | 267  | 213      | 218     | 65   | 201   | 265  | 268   | 312   | 302  | 553    | 88     |
| 1967 | 247   | 297         | 162    | 277  | 213      | 226     | 67   | 206   | 267  | 282   | 312   | 313  | 536    | 91     |
| 1968 | 252   | 316         | 163    | 287  | 207      | 225     | 71   | 221   | 280  | 293   | 306   | 340  | 513    | 98     |
| 1969 | 259   | 328         | 166    | 293  | 207      | 232     | 73   | 228   | 306  | 294   | 316   | 355  | 475    | 118    |
| 1970 | 270   | 339         | 168    | 316  | 209      | 245     | 75   | 236   | 322  | 303   | 331   | 367  | 510    | 122    |
| 1971 | 278   | 349         | 166    | 334  | 214      | 257     | 77   | 238   | 329  | 312   | 351   | 365  | 526    | 128    |
| 1972 | 281   | 367         | 154    | 346  | 217      | 261     | 79   | 246   | 333  | 324   | 370   | 354  | 509    | 117    |
| 1973 | 289   | 385         | 152    | 360  | 219      | 267     | 82   | 253   | 342  | 338   | 388   | 358  | 519    | 125    |
| 1974 | 301   | 401         | 153    | 369  | 224      | 273     | 84   | 261   | 369  | 345   | 408   | 380  | 527    | 132    |
| 1975 | 312   | 422         | 150    | 389  | 229      | 263     | 86   | 271   | 395  | 363   | 427   | 381  | 562    | 143    |
| 1976 | 322   | 446         | 150    | 397  | 252      | 271     | 89   | 270   | 414  | 379   | 446   | 375  | 597    | 151    |
| 1977 | 327   | 461         | 152    | 396  | 264      | 273     | 90   | 271   | 416  | 399   | 457   | 378  | 604    | 158    |
| 1978 | 330   | 482         | 151    | 411  | 267      | 271     | 93   | 276   | 426  | 405   | 463   | 370  | 604    | 158    |
| 1979 | 337   | 489         | 152    | 426  | 276      | 273     | 96   | 277   | 435  | 412   | 467   | 371  | 636    | 169    |
| 1980 | 341   | 495         | 155    | 432  | 285      | 276     | 96   | 280   | 452  | 419   | 478   | 360  | 652    | 180    |

**Annex B. 1**  
**East German GDP from 1950 to 1991**

|      | Total | Agricult. | Public Ut. | Mining | Manufact. | Construct | Transp. | Other |
|------|-------|-----------|------------|--------|-----------|-----------|---------|-------|
| 1950 | 100   | 100       | 100        | 100    | 100       | 100       | 100     | 100   |
| 1951 | 113   | 119       | 111        | 110    | 114       | 112       | 108     | 113   |
| 1952 | 122   | 129       | 119        | 115    | 125       | 114       | 116     | 122   |
| 1953 | 133   | 117       | 125        | 125    | 143       | 118       | 124     | 133   |
| 1954 | 145   | 129       | 136        | 131    | 160       | 120       | 133     | 145   |
| 1955 | 153   | 125       | 149        | 143    | 170       | 122       | 142     | 153   |
| 1956 | 160   | 124       | 163        | 146    | 179       | 128       | 148     | 160   |
| 1957 | 167   | 135       | 170        | 150    | 187       | 134       | 155     | 168   |
| 1958 | 174   | 145       | 183        | 152    | 194       | 137       | 166     | 174   |
| 1959 | 187   | 140       | 194        | 153    | 212       | 150       | 184     | 187   |
| 1960 | 196   | 145       | 207        | 159    | 224       | 156       | 193     | 196   |
| 1961 | 199   | 129       | 219        | 165    | 228       | 158       | 198     | 199   |
| 1962 | 206   | 125       | 232        | 170    | 238       | 164       | 207     | 206   |
| 1963 | 210   | 138       | 243        | 172    | 240       | 165       | 222     | 210   |
| 1964 | 216   | 138       | 256        | 175    | 246       | 173       | 246     | 216   |
| 1965 | 220   | 152       | 269        | 171    | 248       | 182       | 256     | 220   |
| 1966 | 225   | 159       | 284        | 169    | 253       | 188       | 268     | 225   |
| 1967 | 235   | 166       | 297        | 162    | 257       | 232       | 292     | 235   |
| 1968 | 241   | 169       | 316        | 163    | 263       | 238       | 309     | 241   |
| 1969 | 244   | 161       | 328        | 166    | 271       | 223       | 331     | 245   |
| 1970 | 256   | 155       | 339        | 168    | 283       | 241       | 375     | 256   |
| 1971 | 262   | 151       | 349        | 166    | 292       | 245       | 393     | 262   |
| 1972 | 270   | 166       | 367        | 154    | 297       | 275       | 400     | 270   |
| 1973 | 282   | 169       | 385        | 152    | 306       | 310       | 429     | 282   |
| 1974 | 295   | 180       | 401        | 153    | 320       | 337       | 438     | 295   |
| 1975 | 305   | 178       | 422        | 150    | 332       | 353       | 455     | 305   |
| 1976 | 314   | 164       | 446        | 150    | 344       | 368       | 476     | 314   |
| 1977 | 320   | 179       | 461        | 152    | 349       | 378       | 462     | 320   |
| 1978 | 323   | 175       | 482        | 151    | 353       | 380       | 454     | 323   |
| 1979 | 327   | 185       | 489        | 152    | 360       | 370       | 468     | 327   |
| 1980 | 332   | 186       | 495        | 155    | 365       | 376       | 480     | 332   |
| 1981 | 340   | 191       | 501        | 157    | 371       | 406       | 478     | 340   |
| 1982 | 334   | 189       | 514        | 159    | 366       | 392       | 439     | 334   |
| 1983 | 336   | 198       | 531        | 160    | 364       | 396       | 460     | 336   |
| 1984 | 343   | 214       | 559        | 166    | 372       | 389       | 469     | 343   |
| 1985 | 349   | 223       | 576        | 170    | 380       | 383       | 471     | 349   |
| 1986 | 351   | 220       | 584        | 170    | 380       | 386       | 498     | 351   |
| 1987 | 349   | 220       | 580        | 168    | 380       | 365       | 536     | 349   |
| 1988 | 348   | 205       | 593        | 169    | 384       | 351       | 538     | 348   |
| 1989 | 341   | 207       | 594        | 161    | 381       | 312       | 549     | 341   |
| 1990 | 311   | 188       | 653        | 129    | 273       | 303       | 481     | 369   |
| 1991 | 231   | 141       | 588        | 73     | 120       | 318       | 252     | 331   |

### Sources for agriculture

The agricultural sector encompasses animal production, crops, forestry and fisheries. For the series presented above the estimates are primarily based on estimates of the *Research Project on National Income in East Central Europe*. Their findings were derived from several occasional papers which together cover total crop and animal production, i.e. agriculture except forestry and fisheries, from 1950 to 1989. From 1965 to 1989 this source offers data which includes forestry and fisheries.

Until 1970 the series are based on indexes for various physical products, which were weighted at East German prices for 1965.<sup>1</sup> To arrive at the *Research Project* subtracted the main inputs. It distinguished between "intermediate products" and "current operating expenses". Intermediate products are those products that are utilised on farms in further production, i.e. seed, feed, and manure. Current operating expenses are defined as the total value of all goods and services bought by the agricultural sector from all nonagricultural sectors, including the foreign sector, and used up in agricultural production.

For the period from 1950 to 1965 a rough estimation completes the picture for forestry and fisheries. It was assumed that input output relationship in these sectors did not change during this period. The indices that were used are "Holzeinschlag" (timber) for forestry and "Fangergebnis" (total catch) for fisheries as can be found in the statistical yearbook.<sup>2</sup> The timeseries of the production of these two physical indicators were weighted at the value for timber and total catch in 1964 (West German prices), as can be found in Sturm.<sup>3</sup> The same source has been used for weighting the series for agriculture and for forestry/fisheries. This results in the following series for value added.

|      | Agriculture | Forestry | Fisheries | Total  |
|------|-------------|----------|-----------|--------|
| 1950 | 76.01       | 120.04   |           | 77.79  |
| 1951 | 91.81       | 122.67   | 70.44     | 92.79  |
| 1952 | 100.12      | 101.60   | 87.54     | 100.03 |
| 1953 | 90.08       | 106.47   | 99.21     | 90.85  |
| 1954 | 100.00      | 100.00   | 100.00    | 100.00 |
| 1955 | 97.69       | 91.22    | 109.19    | 97.57  |
| 1956 | 96.89       | 81.42    | 119.16    | 96.53  |
| 1957 | 105.54      | 79.53    | 153.64    | 105.07 |
| 1958 | 113.49      | 77.01    | 148.42    | 112.45 |
| 1959 | 109.46      | 70.39    | 168.02    | 108.59 |
| 1960 | 113.26      | 72.30    | 182.03    | 112.44 |
| 1961 | 100.00      | 68.54    | 207.09    | 100.01 |
| 1962 | 96.31       | 67.42    | 238.97    | 96.85  |
| 1963 | 107.15      | 61.73    | 294.15    | 107.56 |
| 1964 | 106.69      | 57.05    | 347.07    | 107.56 |
| 1965 | 117.76      | 56.32    | 365.08    | 118.25 |

After 1965 the *Research Project* included forestry and fisheries in their series. Thus it was not necessary to make additional estimates for these sectors. From 1970 onwards the *Research Project* used the official net material product as the shortcut basis of their estimates. It is stated that as a consequence of the economic reforms in the 1960s more methodological information on the statistics became available, which allowed the conclusion that the official measures of net material product originating in agriculture are calculated by methods closely resembling those used in the West for

<sup>1</sup> Gregor Lazarcik, *East German Agricultural Production, Expenses, Gross and Net Product, and Productivity, 1934-38 and 1950-1970* (New York 1972) OP-36

<sup>2</sup> Staatliche Zentralverwaltung für Statistik, *Statistisches Jahrbuch 1969 der Deutschen Demokratischen Republik* (Berlin-Ost 1969)

<sup>3</sup> Peter Hans Sturm, *A Comparison of Aggregate Production Relationships in East and West Germany* (Yale 1974) p. 206 It means that fisheries is weighed at 115 Mill. DM, forestry at 387 Mill. DM, and agriculture at

### Sources for agriculture

The agricultural sector encompasses animal production, crops, forestry and fisheries. For the series presented above the estimates are primarily based on estimates of the *Research Project on National Income in East Central Europe*. Their findings were derived from several occasional papers which together cover total crop and animal production, i.e. agriculture except forestry and fisheries, from 1950 to 1989. From 1965 to 1989 this source offers data which includes forestry and fisheries.

Until 1970 the series are based on indexes for various physical products, which were weighted at East German prices for 1965.<sup>1</sup> To arrive at the *Research Project* subtracted the main inputs. It distinguished between "intermediate products" and "current operating expenses". Intermediate products are those products that are utilised on farms in further production, i.e. seed, feed, and manure. Current operating expenses are defined as the total value of all goods and services bought by the agricultural sector from all nonagricultural sectors, including the foreign sector, and used up in agricultural production.

For the period from 1950 to 1965 a rough estimation completes the picture for forestry and fisheries. It was assumed that input output relationship in these sectors did not change during this period. The indices that were used are "Holzeinschlag" (timber) for forestry and "Fangergebnis" (total catch) for fisheries as can be found in the statistical yearbook.<sup>2</sup> The timeseries of the production of these two physical indicators were weighted at the value for timber and total catch in 1964 (West German prices), as can be found in Sturm.<sup>3</sup> The same source has been used for weighting the series for agriculture and for forestry/fisheries. This results in the following series for value added.

|      | Agriculture | Forestry | Fisheries | Total  |
|------|-------------|----------|-----------|--------|
| 1950 | 76.01       | 120.04   |           | 77.79  |
| 1951 | 91.81       | 122.67   | 70.44     | 92.79  |
| 1952 | 100.12      | 101.60   | 87.54     | 100.03 |
| 1953 | 90.08       | 106.47   | 99.21     | 90.85  |
| 1954 | 100.00      | 100.00   | 100.00    | 100.00 |
| 1955 | 97.69       | 91.22    | 109.19    | 97.57  |
| 1956 | 96.89       | 81.42    | 119.16    | 96.53  |
| 1957 | 105.54      | 79.53    | 153.64    | 105.07 |
| 1958 | 113.49      | 77.01    | 148.42    | 112.45 |
| 1959 | 109.46      | 70.39    | 168.02    | 108.59 |
| 1960 | 113.26      | 72.30    | 182.03    | 112.44 |
| 1961 | 100.00      | 68.54    | 207.09    | 100.01 |
| 1962 | 96.31       | 67.42    | 238.97    | 96.85  |
| 1963 | 107.15      | 61.73    | 294.15    | 107.56 |
| 1964 | 106.69      | 57.05    | 347.07    | 107.56 |
| 1965 | 117.76      | 56.32    | 365.08    | 118.25 |

After 1965 the *Research Project* included forestry and fisheries in their series. Thus it was not necessary to make additional estimates for these sectors. From 1970 onwards the *Research Project* used the official net material product as the shortcut basis of their estimates. It is stated that as a consequence of the economic reforms in the 1960s more methodological information on the statistics became available, which allowed the conclusion that the official measures of net material product originating in agriculture are calculated by methods closely resembling those used in the West for

<sup>1</sup> Gregor Lazarcik, *East German Agricultural Production, Expenses, Gross and Net Product, and Productivity, 1934-38 and 1950-1970* (New York 1972) OP-36

<sup>2</sup> Staatliche Zentralverwaltung für Statistik, *Statistisches Jahrbuch 1969 der Deutschen Demokratischen Republik* (Berlin-Ost 1969)

<sup>3</sup> Peter Hans Sturm, *A Comparison of Aggregate Production Relationships in East and West Germany* (Yale 1974) p. 206 It means that fisheries is weighed at 115 Mill. DM, forestry at 387 Mill. DM, and agriculture at

calculating the net product of agriculture. To approximate the gross value added (rather than net value added) the value of depreciation was added to the value of net material product.<sup>4</sup> The linkage from 1989 to 1991 is based on calculations of Müller-Krumholz.

#### Sources for Public Utilities, Mining, and Manufacturing

Backgrounds to the series on mining, manufacturing, and public utilities are described in great detail in Annex A. Linkage from 1989 to 1991 for mining and manufacturing was based on quantity indicators as shown in Annex A. Public Utilities was derived from calculations of the *DIW*, provided to me by Andreas Cors. These data included public utilities and mining. To arrive at an estimate for public utilities I used the earlier mentioned estimates for mining and I assumed the relative size of the two sectors in 1991 (mining 46 percent, public utilities 54 percent).

#### Sources on Construction

For the period from 1950 to 1989 the series for the construction sector are based on two indicators: "Gebaute Wohnungen" and "Geschaffene Wohnfläche". The two physical indicators were weighted at 50 percent each. For the period between 1950 and 1967 the results based on these indicators show enormous fluctuation. Therefore the in between years were based on intrapolations using official statistics on production in this sector as was found in *Staatlichen Zentralverwaltung für Statistik, Statistisches Jahrbuch 1968 Der Deutschen Demokratischen Republik* (Berlin 1968), p. 25.

Although the indicators "Gebaute Wohnungen" and "Geschaffene Wohnfläche" are also available for 1990 and 1991, I prefer calculations of the *DIW*, provided to me by Andreas Cors. In my opinion the two indicators are inadequate for a linkage of the period before and after reunification. During this period the emphasis in the construction sector was replaced from building new houses towards building infrastructure and restoring old houses. Would the linkage have been based on "Gebaute Wohnungen" and "Geschaffene Wohnfläche", than production in 1991 would have amounted less than than in 1950. Such a result is clearly not satisfactory, considering the fact that after the unification East German construction is seen as the most succesful sector.

#### Sources on Transports and Communication

For the period from 1950 to 1989 the series for the sector "transports and communication" were based on four indicators: ton-kilometers, person-kilometers, short distance calls, long distance calls. Linkage of 1989 to 1991 was also based on quantity indicators, though here the sample was based on indicators for transports only.

#### Weights

To arrive at total GDP the series for sectors were weighted at their value added in 1991: 'other sectors' are implicit for the period from 1950 to 1989 as they are assumed to show the same development as GDP. For the linkage from 1989 to 1991 the performance in other sectors was based on Müller Krumholz and for these three years the changes in 'other sectors' were accounted for in the development of the total economy.

<sup>4</sup> Thad P. Alton, et al., *Statistics on East European Economic Structure and Growth* (New York 1975) OP-48;

Thad P. Alton, et al., *Economic Growth in Eastern Europe 1965-1979* (New York 1980) OP-59; Thad P. Alton,

**Annex B. 2**  
**East German Employment (thousands) from 1950 to 1995**

|      | Total | Agricult. | Public Ut. | Mining | Manufact. | Construct | Transp. | Other |
|------|-------|-----------|------------|--------|-----------|-----------|---------|-------|
| 1950 | 8331  | 2122      | 78         | 149    | 2496      | 521       | 472     | 2493  |
| 1951 | 8331  | 1950      | 84         | 159    | 2683      | 497       | 492     | 2466  |
| 1952 | 8331  | 1746      | 86         | 164    | 2823      | 470       | 519     | 2523  |
| 1953 | 8331  | 1723      | 87         | 170    | 2908      | 510       | 500     | 2433  |
| 1954 | 8414  | 1749      | 92         | 184    | 2940      | 481       | 533     | 2435  |
| 1955 | 8414  | 1821      | 93         | 187    | 2935      | 488       | 520     | 2371  |
| 1956 | 8414  | 1708      | 93         | 189    | 2915      | 488       | 538     | 2484  |
| 1957 | 8414  | 1653      | 96         | 195    | 3020      | 495       | 551     | 2404  |
| 1958 | 8414  | 1596      | 97         | 199    | 3085      | 505       | 559     | 2374  |
| 1959 | 8414  | 1513      | 99         | 202    | 3167      | 521       | 568     | 2344  |
| 1960 | 8414  | 1379      | 102        | 199    | 3175      | 527       | 575     | 2457  |
| 1961 | 8414  | 1352      | 104        | 199    | 3172      | 511       | 584     | 2493  |
| 1962 | 8414  | 1354      | 105        | 199    | 3152      | 512       | 588     | 2504  |
| 1963 | 8414  | 1328      | 108        | 201    | 3135      | 513       | 585     | 2544  |
| 1964 | 8498  | 1271      | 110        | 203    | 3157      | 513       | 581     | 2661  |
| 1965 | 8498  | 1248      | 111        | 201    | 3172      | 510       | 588     | 2667  |
| 1966 | 8498  | 1214      | 112        | 202    | 3202      | 508       | 586     | 2672  |
| 1967 | 8581  | 1190      | 111        | 196    | 3247      | 525       | 581     | 2730  |
| 1968 | 8664  | 1131      | 110        | 195    | 3245      | 563       | 576     | 2844  |
| 1969 | 8748  | 1086      | 105        | 187    | 3270      | 588       | 590     | 2920  |
| 1970 | 8748  | 1055      | 105        | 186    | 3272      | 603       | 603     | 2925  |
| 1971 | 8748  | 1031      | 108        | 187    | 3280      | 601       | 604     | 2937  |
| 1972 | 8831  | 991       | 112        | 189    | 3287      | 607       | 611     | 3033  |
| 1973 | 8914  | 972       | 115        | 191    | 3297      | 610       | 617     | 3113  |
| 1974 | 8997  | 955       | 118        | 192    | 3305      | 617       | 620     | 3190  |
| 1975 | 8997  | 946       | 122        | 194    | 3312      | 624       | 624     | 3176  |
| 1976 | 9081  | 929       | 125        | 194    | 3337      | 634       | 628     | 3233  |
| 1977 | 9247  | 925       | 128        | 195    | 3360      | 641       | 632     | 3366  |
| 1978 | 9331  | 927       | 132        | 196    | 3385      | 647       | 634     | 3411  |
| 1979 | 9414  | 927       | 135        | 197    | 3407      | 650       | 634     | 3465  |
| 1980 | 9497  | 929       | 138        | 197    | 3430      | 653       | 636     | 3514  |
| 1981 | 9497  | 936       | 138        | 199    | 3439      | 654       | 637     | 3493  |
| 1982 | 9581  | 940       | 138        | 202    | 3447      | 655       | 643     | 3555  |
| 1983 | 9664  | 953       | 138        | 204    | 3454      | 653       | 649     | 3613  |
| 1984 | 9747  | 968       | 138        | 206    | 3462      | 653       | 650     | 3669  |
| 1985 | 9747  | 976       | 139        | 208    | 3469      | 648       | 654     | 3653  |
| 1986 | 9747  | 980       | 141        | 208    | 3462      | 643       | 650     | 3663  |
| 1987 | 9747  | 982       | 143        | 208    | 3457      | 638       | 657     | 3663  |
| 1988 | 9831  | 982       | 145        | 208    | 3449      | 635       | 660     | 3751  |
| 1989 | 9747  | 976       | 144        | 205    | 3410      | 627       | 663     | 3723  |
| 1990 | 8664  | 651       | 126        | 180    | 2998      | 653       | 598     | 3458  |
| 1991 | 7321  | 454       | 115        | 118    | 2049      | 705       | 539     | 3341  |
| 1992 | 6387  | 282       | 98         | 78     | 1306      | 800       | 481     | 3342  |

Sources: Statistisches Bundesamt, *Sonderreihe mit Beiträgen für das Gebiet der ehemaligen DDR. Heft 14. Erwerbstätige 1950 bis 1989* (Wiesbaden 1994); Staatlichen Zentralverwaltung für Statistik, *Statistisches Jahrbuch der Deutschen Demokratischen Republik*, various issues (Berlin-Ost); Wolfgang Fritz, "Historie der amtlichen Statistiken der Erwerbstätigkeit in Deutschland. Ein fragmentarischer Abriß: Darstellungen, Quellen, Daten, Definitionen, Chronik" in: *Historical Social Research Supplement 13* (Köln 2001) pp. 199 juncto 219.

**Annex C. 1**  
**East German and West German industries in 1936**

This annex shows the industrial classification that is used in this paper. It resembles the international standard of industrial classifications of the United Nations.<sup>5</sup> The table below shows the categories of this research (left) and the categories of the industrial census to which it responds (right).

**Table of Industrial Classification**

| <b>This Research</b>                        | <b>Industrial Census</b>                                                                                                                                                                                                                                                                   |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mining                                      | Bergbau (I, Mining)                                                                                                                                                                                                                                                                        |
| Food, Beverages, Tobacco                    | Industrie der Öle und Fette, Futtermittel und tierischen Leime (XXVI, Mnf. Fats); Spiritusindustrie (XXVII, Mnf. Spirits); Nahrungs- und Genussmittelindustrie (XXVIII, Mnf. Food)                                                                                                         |
| Textiles, Wearing Apparel                   | Textilindustrie (XXIV, Mnf. Textiles); Bekleidungsindustrie (XXV, Mnf. Wearing Apparel)                                                                                                                                                                                                    |
| Leather Products, Footwear                  | Lederindustrie (XXIII, Leatherindustry)                                                                                                                                                                                                                                                    |
| Wood Products, Furniture                    | Sägeindustrie (XVI, Mnf. Timber); Holzverarbeitende Industrie (XVII, Mnf. Wood Products)                                                                                                                                                                                                   |
| Paper and Printing                          | Papier-, Pappen-, Zellstoff- und Holzstoffindustrie (XXI, Mnf. Paper); Druck und Papierverarbeitung (XXII, Paper and Printing)                                                                                                                                                             |
| Chemicals, Rubber, Plastic and Oil Refining | Kraftstoffindustrie (II, Fuel industries); Chemische Industrie (XVIII, Chemical industry); Chemisch-technische Industrie (XIX); Kautschuk- u. Asbestindustrie (XX, Mnf. Rubber)                                                                                                            |
| Stone, Clay, Glass                          | Industrie der Steine und Erden (XIII, Stone, Clay); Keramische Industrie (XIV, Ceramics); Glasindustrie (XV, Glass)                                                                                                                                                                        |
| Basic and Fabricated Metal Products         | Eisenschaffende Industrie (III, Basic iron and steel); Nichteisenmetallindustrie (IV, Basic non-ferrous metals); Giessereiindustrie (V, Casting of metals); Eisen- u. Stahlwarenindustrie (VI, Mnf. Fabricated metal products); Stahl- und Eisenbau (VIII, Mnf. Structural metal products) |
| Machinery and Transport                     | Maschinenbau (VII, Machinery); Fahrzeugindustrie (IX, Mnf. Vehicles); [einschliesslich Luftfahrtindustrie]                                                                                                                                                                                 |
| Electrical Equipment                        | Elektroindustrie (X, Electrical equipment)                                                                                                                                                                                                                                                 |
| Optics and Fine Mechanics                   | Metallwarenindustrie u. verwandte Gewerbe (XII, Mnf. Metal products); Feinmechanische und Optische Industrie (XI, Optics and Fine Mechanics)                                                                                                                                               |
| Utilities                                   | Elektrizitäts- und Gasversorgung (XXIX, Utilities); [Wasserversorgung]                                                                                                                                                                                                                     |

The source of the industrial census is BArch R 3102/ 3309.

<sup>5</sup> *United Nations, International Standard Industrial Classification of all Economic Activities*, New York 1990 Series M/ No. 4, Rev. 3.

### **Annex D. 3**

#### **Abbreviations**

|       |                                                                                                           |
|-------|-----------------------------------------------------------------------------------------------------------|
| BArch | Bundesarchiv (Berlin-Lichterfelde)                                                                        |
| DIW   | Deutsches Institut für Wirtschaftsforschung (Berlin)                                                      |
| ICOP  | International Comparisons of Output and Productivity project (at Groningen Growth and Development Centre) |
| IWH   | Institut für Wirtschaftsforschung Halle                                                                   |
| MIT   | Massachusetts Institute of Technology                                                                     |
| NBER  | National Bureau of Economic Research                                                                      |
| OECD  | Organisation for Economic Co-operation and Development                                                    |
| WIIW  | Wiener Institut für Internationale Wirtschaftsvergleiche                                                  |

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