A Tale of Two States: A Comparative Study of Higher Education Reform and its Effects on Economic Growth in East and West Germany 1945 – 1989

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Abstract

The hypothesis at the heart of this thesis is that long-term economic growth depends on the discovery and development of new ideas and technologies which enable innovation resulting in increased productivity. As technological innovation generally results from research processes instigated and performed by those with higher levels of education, it becomes important to analyse higher education as an economic actor as well as a symbolic institution of cultural and elite reproduction. The thesis compares the development of higher levels of human capital in East and West Germany over the period 1945 – 1990: states with two very different and competing myths of democratic legitimacy and radically opposed social, political and economic systems but both convinced that human capital development held the key to reconstruction and economic growth. In highlighting the imperatives for reform and outlining the main changes which took place in higher education within the strictures imposed by competing ideologies, the thesis assesses the effectiveness of human capital investment in terms of the success of the economic objectives identified by both countries. The thesis finds that the initial hypothesis is proven, albeit that its effectiveness was mitigated by a number of external economic shocks and internal social and political factors which, in the end, led to the demise of the East German regime.

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Finally, I would like to dedicate this piece of work to the memory of the late Professor George Blazyca of the University of Paisley. If it had not been for his encouragement, support and belief in my abilities (when I had none) I would never have progressed beyond the completion of an ordinary degree, far less undertaken something of this complexity. I hope he would have been happy with the end result.

Author's Declaration

I certify that this is my own original work and that all sources used in producing it have been duly acknowledged and cited in the text. All translation from the original German is also my own unless indicated otherwise. This work has not been submitted for any other degree at the University of Glasgow or any other Institution.

Catriona M. Haston

Abbreviations Used in the Text and Notes

ABF	*Arbeiter/Bauer Fakultäten* (Worker/Peasant Faculties)
AdL	*Akademie der Landwirtschaftswissenschaften* (Academy of Agricultural Sciences - GDR)
AdW	*Akademie der Wissenschaften* (Academy of all the Sciences – GDR)
BLK	*Bund-Länder Kommission für Bildungsplanung und Forschungsförderung* (Federal/Land Education Planning Commission)
BMBW	Bundesministerium für Bildung und Wissenschaft (Federal Minstry for Education and Research
DFG	*Deutsche Forschungsgemeinschaft* (German Research Society)
EOS	*Erweiterte Oberschule* (two years extra schooling for the most academically gifted children)
FDJ	*Freie Deutsche Jugend* (Free German Youth – socialist youth movement of the Socialist Unity Party of East Germany
FRG	Federal Republic of Germany
GDR	German Democratic Republic
KPD	*Kommunistische Partei Deutschlands* (German Communist Party)
KWG	*Kaiser-Wilhelm-Gesellschaft zur Förderung der Wissenschaften*
KMK	*Kultusminster Konferenz* (Standing Committee of the Ministers of Culture of the *Länder*)
NES	New Economic System (*Neues Ökonomisches System*)
NS	National Socialist/Socialism
R&D	Research and Development
RWTH	*Rheinisch-Westfälische Technische Hochschule* (Aachen)
SED	*Sozialistische Einheitspartei Deutschlands* (German social Unity Party)
VDI	*Verein Deutscher Ingenieuren* (German Engineering Association)
VDDI	*Verband Deutscher Diplom-Ingenieure* (Association of German Engineering Graduates)
VEB	*Volkseigener Betrieb* (People-Owned Enterprise)
VVB	*Verein Volkseigener Betriebe* (Association of People-Owned Enterprises)
WRK	*Westdeutsche Rektorenkonferenz* (Committee of West German Rectors)

Chapter 1

Introduction and Literature Review

The division of Germany into East and West following WWII provided the perfect crucible for a natural experiment in the effectiveness of the different political, social and economic systems of the two states. Here were two countries which shared the same language and traditions and were tackling the same challenges of reconstruction, nation building, economic recovery and growth, but using methods which were ideologically and institutionally fundamentally opposed. There was, however, a strong conviction on both sides of the Iron Curtain that one solution lay in raising the level of "human capital", particularly in the areas of science and engineering, in order to stimulate economic growth and develop international standing. The debate surrounding the contribution of education to economic growth, however, has always been contentious, not least because of the difficulties inherent in trying to reconcile an enormous number of wildly differing, country-specific variables such as educational tradition, institutional structure and culture, funding methods and levels of state intervention in education policy-formation, all of which have a major impact on education policy design and hence on the economic impact which can be expected from it. This study considers the social, political and economic imperatives behind the educational policy reforms in the German Democratic Republic (GDR) and the Federal Republic of Germany (FRG), as well as the factors which affected their implementation and aims to help distinguish the variables, clarify the differences in approach and, ultimately, assess their relative effectiveness in terms of improving productivity and economic growth and international competitiveness.

Because there is widespread consensus among economists that much of the scientific and technological progress which leads to economic growth stems from the advanced theoretical knowledge acquired at higher education level, the focus of my thesis is the interconnections between higher education, labour markets and economic performance and an analysis of the efficacy of specific courses of action practised by East and West. This focus has at its heart the debate on the effectiveness of human capital development as an economic tool, and by extension, how changes to the ethos of higher education can affect economic growth. The thesis will also highlight the tensions inherent in balancing social, political and economic agendas due to political manoeuvring and the obduracy of

entrenched socio-economic networks in both states. In an article for *Comparative Education*, Arthur Hearnden wrote:

> Comparative study of East and West Germany will have made a valuable contribution if it can demonstrate that policies based on social ideology unrelated to objective analysis of their economic implications or conversely on economic expediency without taking account of social implications are unfruitful[1]

It is my hope that this particular study can make a contribution to this debate and, hence, to that on the economic development of the two Germanys.

The thesis covers the whole period of the formal division of Germany into two countries from 1949 – 1990 because only by considering the period of partition in its entirety can the results of the natural experiment be properly assessed. It is, however, divided into two parts: 1949 to ca. 1970 and ca. 1970 – 1990. The beginning of the 1970s heralded some radical and far-reaching changes in the political, social and economic spheres of both countries and consequently in their higher education systems. In the West, 1969 saw the advent of the first left-leaning SDP-led ruling coalition since the creation of the FRG, bringing with it a change in attitude regarding the function of higher education and a more egalitarian approach to accessing it. In the East, the resignation of Walter Ulbricht as party leader in 1971 led to the accession of Erich Honecker, who had a very different vision of the development of socialism in the GDR than that of his predecessor. Both countries' economies were also strongly affected by external factors. In particular, the West was strongly affected by the oil crises of the 1970s, which had economic repercussions well into the 1980s. While the GDR was protected initially by the long-term price agreements for oil with Russia and for hard coal with Poland, further agreements negotiated at a much higher price significantly impeded its recovery from the effects of the second oil crisis.

The remainder of this introduction reviews the literature pertinent to the thesis, starting with a discussion of the literature on human capital development theory and that on the linked overeducation debate which developed as the number of students in higher education began to increase significantly. This is followed by a review of the historiography of scientific and technical education in the two Germanys and of the

[1] Arthur Hearnden, 'Inter-German Relations and Educational Policy' in *Comparative Education*, Vol.9, No.1, 1973, p 14

relevant literature comparing East and West Germany. I conclude with a summary of the methodology employed and details of the thesis structure.

Human Capital Development

Empirically, the contribution of higher levels of education to economic growth is particularly hard to prove with many and varied studies by human capital theorists, overeducation theorists and economists often proving completely contradictory. Much research into the causes of economic growth was undertaken during the 1950s. In particular, Robert Solow refuted the then common belief that long-term growth would be achieved through investment in industry and infrastructure and the move to capital-intensive automated production. Reasoning that diminishing returns to capital would ultimately result in only a short-term burst of economic growth, he developed an economic growth model which argued that growth was determined by inputs of land, labour, capital and a fourth factor (the Solow residual) which was identified as innovation and technological progress.[2] The standard neoclassical theory of economic growth, while assuming worldwide technical progress as a given, maintains that economic growth results from accumulated stocks of factor inputs. Thus, as the marginal product of any factor of production is subject to the law of diminishing returns, the accumulation of human capital would, it is argued, have at best a transitory effect on growth rates. The technological progress theory, in contrast, argues that as in principle all countries have access to the same machines and technologies, the difference in its productive use results from a country's available stock of human capital (defined as including the creation of new knowledge in the individual and his/her ability to apply it) which brings increasing returns to scale.[3] In this way investment in human capital can have a permanent effect on the rate of economic growth through its ability to facilitate innovation and/or the adoption and implementation of new technology which, in turn, increases productivity and economic growth. A secondary benefit is that a well-educated workforce is frequently a catalyst for attracting

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[2] See Robert M. Solow, 'A Contribution to the Theory of Economic Growth', *Quarterly Journal of Economics*, Vol.70, No.1, 1956, pp 65 – 94; and Robert M. Solow, 'Technical Change and the Aggregate Production Function', *Review of Economics and Statistics*, Vol.3, No.3, 1957, pp 312 – 320

[3] For a discussion on this see Ludger Wößmann, *Schooling and the Quality of Human Capital*, (Berlin, Springer, 2002), p 34; pp 39 – 47; Gary Becker, Kevin M. Murphy and Robert Tamura, 'Human Capital, Fertility and Economic Growth' in Gary Becker (ed.), *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education, 3rd Ed.*, (Chicago, University of Chicago Press, 1993), pp 324 – 327

foreign investment, both financial and in the form of physical capital.[4] Logically, then, the new ideas and new technologies crucial to creating and sustaining high growth levels depend fundamentally on the development of high levels of human capital. Studies such as Solow's, and later those of Theodore W. Schulz[5] and Gary Becker,[6] were instrumental in determining policy in post-war nations and encouraging investment in research and technology. More recently, commentators such as Richard Florida have highlighted the move towards a 'knowledge economy': the emergent significance of constantly increasing levels of knowledge to the promotion of innovative behaviour, technological progress, entrepreneurship, job creation, economic growth, and the resultant tendency to form nexuses in specific geographical areas.[7]

Even by the 1960s, however, human capital development theory had come increasingly to be regarded as too simplistic by some economists. For example, a number of studies[8] appeared to show that any potential direct causal link would be distorted by a large number of factors at firm level, such as the differing age of physical capital employed, different management styles, pricing policy and research orientation. At the macro level, distorting factors might include national and supra-national legislation, market idiosyncrasies and level of international competition. Moreover, while it was entirely possible that more highly educated personnel would make a disproportionate contribution to output, this would be offset financially by their entitlement to higher salaries.[9] Thus, the evidence in favour of human capital development theory seemed inconclusive. More recently, though, Wößmann's 1990 study applied a human-capital augmented neoclassical model of growth and development to 132 countries across the globe and, in a second study, to the OECD countries alone. These appeared to confirm that human capital development accounted for between 45 – 60 percent of the dispersion of levels of economic development in the larger study and virtually 100 percent in the more uniformly technically advanced OECD

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[4] Clive R. Belfield, *Economic Principles for Education: Theory and Evidence*, (Cheltenham, Edward Elgar, 2000), pp 200 – 201; Gary Becker, Kevin M. Murphy and Robert Tamura, 'Human Capital, Fertility and Economic Growth', p 307

[5] Schultz Theodore, *The Economic Value of Education*, (New York, Columbia University Press, 1963)

[6] Gary S. Becker, *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education, 1st Ed.*, (New York, Columbia University Press, 1964)

[7] Richard Florida, 'Entrepreneurship, Creativity, and Regional Economic Growth' in David M. Hart (Ed.), *The emergence of entrepreneurship policy: governance, start-up and growth in the U.S. knowledge economy*, (Cambridge and New York, CUP, 2003), pp 39 – 59

[8] Examples include a 1970 OECD study comparing entire sectors of an economy across 52 countries which found no definite proportionate relationship between the level of output per head and years of individual education cited in Mark Blaug, *The Economics of Education and the Education of an Economist*, (Aldershot, Edward Elgar Publishing, 1987), p 89; and P.R.G. Layard, J.D. Sargan, M.E. Ager and D.J. Jones, *Qualified Manpower and Economic Performance*, (London, Allen Lane, 1971) which analysed a cross-sectional study of 68 electrical engineering plants in Britain

[9] Blaug, *The Economics of Education and the Education of an Economist*, pp 88 – 91

countries.[10] This, in turn, resonates with the findings of other commentators who argue that, based on empirical statistics, countries with a higher average number of years of education across the labour force had faster levels of economic growth; that countries with a faster growing general qualifications level grew faster; and that education was a more immediate and effective way to raise economic growth than inputs of labour and capital which may be inelastic in the short run.[11]

The logic that better education can and does raise the efficiency of the labour force within certain parameters, such as the need for constant skills updating in an age of rapid technological change, is very attractive. Moreover, education can improve the capacity of the labour force to adopt new technology and, in some cases, will of itself lead to the creation of new technology. However, in order for this to be the case, certain preconditions are necessary. These include the 'right' type of government, the security of property rights, and effective competition including within the labour markets.[12] Without these in place, human capital development's ability to influence growth appears less evident. Research also indicates that when the responsibility for decision-making in, and the funding of, education lies with a central authority where the decision-makers are unfamiliar with local needs, educational performance seems to suffer. Statistically, this appears to be particularly so in the sciences which are more influenced by the changes incurred through technological advance and thus lend themselves less easily to standardisation of the curriculum.[13] Moreover, without market incentives and constraints, even the impulse to innovate is significantly reduced; therefore, the argument runs that a fully state controlled educational system can only function feasibly where innovation is relatively unimportant.[14] Thus, in order to encourage the most up-to-date teaching and to maximise the potential for cutting edge research and innovative effort, there is a need for individual autonomy in, and competition between, educational institutions. By exploring the comparison between the East and West German experiences, my thesis seeks to assess the validity of this hypothesis.

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[10] Wößmann, *Schooling and the Quality of Human Capital*, p 48

[11] See for example Welch (1970) cited in Blaug, *The Economics of Education and the Education of an Economist,* p 95*;* Belfield, *Economic Principles for Education: Theory and Evidence*, pp 200 – 202; see also Becker, Murphy and Tamura, 'Human Capital, Fertility and Economic Growth', p 324; Günther Rehme, '(Re-)Distribution of Personal Incomes, Education and Economic Performance Across Countries', Luxembourg Income Study Working Paper no. 299, March 2002, http://www.lisproject.org/publications/liswps/299.pdf (accessed 19.3.2006); Claudia Goldin and Lawrence F. Katz, *The Race Between Education and Technology*, (Cambridge, Mass., Belknap Press of Harvard University Press, 2008), p 2; p 41;

[12] Goldin and Katz, *The Race Between Education and Technology*, p 2

[13] Wößmann, *Schooling and the Quality of Human Capital*, pp 185 – 186

[14] Andrei Schleifer, cited in Belfield, *Economic Principles for Education: Theory and Evidence*, p 165

It is, of course, possible to posit the reverse scenario, which is simply that it is the increasing levels of economic growth which enable some countries to afford better education for a greater proportion of the populace. Moreover, while human capital development theory appears to hold true for countries such as the USA and Japan, it is not entirely borne out by the experience of others such as Britain and France during the same period, where economic growth did not follow the same trajectory despite increasing qualifications levels. Equally, the explanation for the divergent patterns in these countries may lie in a number of different variables, among which are the standard of education provided, subjects studied, management ethos and practice, labour law, and tradition which resulted in strong cultural attachment to less profitable manufacturing industries and a reluctance to adopt new practice. If the reverse scenario were to hold true, however, it could be seen as one of the factors fuelling the overeducation debate, overeducation being one perceived result of improved levels of human capital development.

Much of the current literature on overeducation is concerned with the effects on individual income of an excess of highly qualified manpower on the employment market. However, another more recent macro-economically focused debate relates to whether in the "race between education and technology",[15] education has raced ahead of technological progress resulting in an oversupply of highly qualified workers, or whether indeed technological advance has outstripped educational progress, in which case there is a need for more intensive and focused educational reform in order to supply more of the increasingly highly skilled labour required to exploit the new technologies.[16] There is, however, a degree of illogicality at the heart of this debate because without educational progress, technological advance becomes at least unlikely, if not impossible. It would appear, therefore, to be a false dichotomy.

A particular fear arose in the 1970s in both East and West Germany (as well as in much of the industrialised world) relating to the employability of increasing numbers of highly

[15] The phrase was first coined by Jan Tinbergen *in Income distribution: Analysis and policies*, (Amsterdam, North Holland Publishing Co., 1975); more recently it is the title of a book by Claudia Goldin and Lawrence F. Katz, *The Race between Education and Technology*, (Cambridge, Mass., Belknap Press of Harvard University Press, 2008)

[16] See for example T.F. Bresnahan, E. Brynjolfsson and L.M.Hitt, 'Information technology, workplace organization and the demand for skilled labor: Firm level evidence', *Quarterly Journal of Economics*, Vol.117, No.1, 2002, pp 339 – 376; S. Machin and J. Van Reenen, 'Technology and changes in skill structure: Evidence from seven OECD countries, *Quarterly Journal of Economics*, Vol. 113, No. 4, 1998, pp 1245 – 1279; Goldin and Katz, *The Race between Education and Technology*, p 6

qualified graduates at a level commensurate with their qualifications.[17] Because higher education represents a significant drain on a country's resources, in one sense overeducation represents a waste of resources if the graduate is employed at a level below that for which he/she has been trained. In another, it can be seen as an important factor in labour market adjustment: in periods of excess supply of highly-skilled workers, employers demonstrate a tendency to employ the more highly skilled in lower-skilled employment because the combination of more advanced theoretical knowledge and practical skills frequently results in increased labour productivity, in effect confirming one of the tenets of human capital development theory. Thus, the problem of graduate unemployment is likely to occur only in a few very specific fields such as medicine, the civil service and teaching. Unemployment is more likely to affect the lower- and unskilled workers; firstly, because qualifications inflation squeezes them out of the job market and secondly, because technology may even replace the labour of lower-skilled individuals in the workplace.[18] Moreover, recent studies have also demonstrated that an increase in the supply of highly skilled labour accelerates the pace of skill-biased technological change which, in turn, creates an increased demand for more highly-skilled workers.[19] The question to be addressed, then, is whether an overeducated workforce actually constitutes a reason for restricting either participation or financial investment in higher education. There is also a further school of thought which argues that market forces in the form of sufficient, appropriate employment opportunities would, in any case, be likely to temper the surge in demand for higher education.[20]

The arguments outlined above are predicated on the idea of a higher education degree in a field which is directly applicable to a particular vocation, rather than an arts or humanities degree with its more nebulous opportunity, often undertaken purely for interest's sake. A

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[17] See for example, Ulrich Teichler and Bikas C Sanyal, *Higher education and the labour market in the Federal Republic of Germany*, (Paris, Unesco Press, 1982), chpt.1; O. Fulton, A. Gordon and G. Williams, *Higher Education and Manpower Planning: A Comparative Study of Planned and Market Economies*, (Geneva, International Labour Organisation, 1982), pp 11 – 13; pp 31 – 32; Blaug, 'Where Are We Now in the Economics of Education?', p 129; Ulrich Teichler, Dirk Hartung, Reinhard Nuthmann, *Education and the Needs of Society*, (Windsor, NFER Publishing Company Ltd., 1980), pp 22 – 24

[18] Myra Wieling and Lex Borghans, 'Discrepancies between Supply and Demand and Adjustment Processes in the Labour Market', in *Labour*, Vol.15, No.1 pp 33 – 56, 2001; a similar point is made by Ulrich Teichler, Dirk Hartung, Reinhard Nuthmann, *Education and the Needs of Society*, pp 19 – 21

[19] Daron Acemoglu, 'Technical Change, Inequality and the Labour Market', in *Journal of Economic Literature*, Vol.40, No.1, 2002, pp 7 – 72; Claudia Goldin and Lawrence F. Katz, 'The Origins of Technology-Skill Complementarity', in *The Quarterly Journal of Economics*, Vol.113, No.3, 1998, pp 693 – 732

[20] See for example, R. Layard and J. King, 'The Impact of Robbins', in Carolyn Baxter, P.J. O'Leary and Adam Westoby, *Economics and Education Policy: a Reader*, (London, Longman, 1977), p 24; CEPES Activities, *Higher Education in Europe*, Vol.2, No.4, 1977, p 42

number of studies[21] have suggested that being overeducated at the start of a working life could result in graduates being unable to make the transition to higher-level occupations, and despite on-the-job training or relocation, being permanently consigned to lower-level employment. The correlation appeared to be stronger among arts and humanities graduates as opposed to graduates of more vocationally-oriented subjects although this varied considerably across countries. Countries such as the Netherlands and Spain did not demonstrate any such effect, or only minimally, whereas it was strongly demonstrated in West Germany. The question is whether this was due to the very different nature of the labour market there,[22] or whether it reflected the disproportionately large numbers of students pursuing humanities degrees in West Germany? If so, does this level of overeducation constitute an argument for what could be seen as a more economically rational approach to the planning of higher education in order to train the type of graduate required to fill identifiable gaps in the workforce and those predicted by manpower demand forecasts?

By the late 1960s the growing discrepancy between the demand for and supply of engineering and science graduates had intensified the debate about the need to try to tailor graduate production to labour market demand in a time of escalating costs in higher education.[23] Manpower demand forecasts were seen as a useful tool in helping to avoid the "under-, mis- or unemployment" of graduates.[24] Despite the apparent logic of the policy, there were a number of problems in practice. One arose from the sheer inconsistency of the results arrived at by the different studies.[25] The second was created by the time scale involved. Most commentators agree that a major problem inherent in manpower-planning was the need to be able to predict the level of economic activity and the development of various branches of industry over periods of ten to twenty years in order to calculate the expected demand for specialists and institute the long-term

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[21] See Felix Büchel, Andries de Grip and Antje Mertens, 'The Overeducated European?' pp 5 – 6; and Peter Dolton and Mary Silles, 'The Determinants and Consequences of Graduate Overeducation', pp 202 – 206 in Felix Büchel, Andries de Grip and Antje Mertens (Eds), *Overeducation in Europe: Current Issues in Theory and Policy*, (Cheltenham, Edward Elgar, 2003)

[22] Büchel, de Grip and Mertens, 'The Overeducated European?', p 6

[23] Fulton, Gordon and Williams, *Higher Education and Manpower Planning,* p 32. Proponents of manpower planning include Hubert S. Parnes, 'Planning education for economic and social development', in Carolyn Baxter, P.J. O'Leary and Adam Westoby, *Economics and Education Policy: a Reader*, (London, Longman, 1977), pp 114 – 127; Friedrich Edding, 'the University Enrolment in West Germany', *Comparative Education Review*, Vol.9, No.1, 1965, pp 5 – 10

[24]Fulton, Gordon and Williams, *Higher Education and Manpower Planning,*, p 15; pp 23 – 24

[25] See for example, Hans-Peter Widmaier et al., 'Bildung und Wirtschaftswachstum – Modellstudie zur Bildungsplanung', *Bildung in neuer Sicht*, Reihe A, Nr.3, Schriftenreihe des Kultusministeriums Baden-Württemberg zur Bildungsforschung, Bildungsplanung, Bildungspolitik, (Neckarverlag, Willingen, 1966) and Hajo Riese, *Die Entwicklung des Bedarfs an Hochschulabsolventen in der Bundesrepublik Deutschland*, unter Mitarbeit von Thomas Kempf, Alexander Krafft und Helmut Schweikert, (Wiesbaden 1967)

educational and financial planning required to achieve this. However, the speed and complexity of technological progress, along with the structural changes which took place in virtually all branches of the economy, arguably rendered much, if not all, of such target-setting irrelevant.[26] Thus, the only way to estimate manpower demand over shorter time periods would be the use of short-term signals provided by the labour market such as unemployment rates, vacancy rates and wage rates.[27] The problem here lies in the operation of subjective factors such as strategic hiring policy, labour law and the market orientation of the country under consideration, all of which affect the free operation of such signals. A third controversy stems from the legal, moral, social and political difficulties intrinsic in imposing entry restrictions to academic subjects. In countries where freedom of choice was constitutionally guaranteed, governments' options were necessarily limited. While this was obviously not a problem in centrally controlled socialist countries, the success of the policy depended greatly on the level of efficiency of the central planners.[28] One of the aims of the thesis is to explore why and how manpower-planning was used in higher education policy development and whether it proved effective as a tool of economic development.

Many of the issues described above are clearly visible in the development of the higher education systems of both East and West Germany. The tackling of issues such as the redesign of higher education to conform to changing economic and social imperatives; the perceived overeducation of the general populace and consequent deficits in areas of the economy requiring lower skills levels; the employability of increasingly large numbers of graduates, especially those with degrees seen as irrelevant to economic growth; and above all, the striving to increase the level of human capital development in those areas of science and technology regarded as crucial to economic growth in a rapidly technologising world form the basis of higher education policy decisions throughout the period under

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[26] Fulton, Gordon and Williams, *Higher Education and Manpower Planning*, pp 38 – 39; Blaug, 'Where Are We Now in the Economics of Education?' makes the point for Western countries, as do Ulrich Teichler, Dirk Hartung, Reinhard Nuthmann, *Education and the Needs of Society*, p 17; Frederick Dainton, 'Objections to Manpower Planning', *Higher Education in Europe*, Vo.2, No.4, 1977, pp 6 – 8; the difficulties were also acknowledged by GDR commentators such as Eckehard Sachse, 'Manpower Planning and a Programme of Higher Education Development in the German Democratic Republic', in *Higher Education in Europe*, Vol.2, No.4, 1977, pp 3 – 5

[27] See for example, Blaug, 'Where Are We Now in the Economics of Education?' (1984), in *The Economics of Education and the Education of an Economist*, p 132

[28] See for example, Raymond Bentley, *Technological change in the German Democratic Republic*, (Boulder, Col., Westview Press, 1984), chpt. 4; Oskar Anweiler, 'Politische Steuerung – gesellschaftlicher Pluralismus – pädagogische Autonomie im Bildungs- und Erziehungswesen sozialistischer Staaten' in Oskar Anweiler (Ed.), *Staatliche Steuerung und Eigendynamik im Bildungs- und Erziehungsesen osteuropäischer Staaten und der DDR*, (Berlin, Verlag Arno Spitz, 1986), p 12; Eckhard Förtsch, 'Science, Higher Education, and Technology Policy', in Kristie Macrakis and Dieter Hoffman (eds), *Science under Socialism: East Germany in Comparative Perspective*, (Cambridge Mass., Harvard University Press, 1999), pp 39 – 41

consideration in this thesis. Moreover, some of the solutions attempted appeared to be common to both countries, although the means of tackling the challenges was obviously highly influenced by the radically opposed social, political and economic orientations of both countries. The following section will trace the institutional development of West and East Germany which resulted from the division of the country into different zones of occupation at the end of the Second World War.

Many of the issues described above are clearly visible in the development of the higher education systems of both East and West Germany. In both cases the tackling of a number of key issues formed the basis of the development of higher education policy decisions throughout the period under consideration in this thesis. These included the redesign of higher education to conform to changing economic and social imperatives; the perceived overeducation of the general populace and consequent deficits in areas of the economy requiring lower skills levels; the employability of increasingly large numbers of graduates, especially those with degrees seen as irrelevant to economic growth; and above all, the striving to increase the level of human capital development in those areas of science and technology regarded as crucial to economic growth in a rapidly technologising world. Moreover, some of the solutions attempted appeared to be common to both countries, although the means by which the challenges were addressed were obviously highly influenced by the radically opposed social, political and economic orientations of both countries. The following section will trace the institutional development of West and East Germany which resulted from the division of the country into different zones of occupation at the end of the Second World War.

Institutional Structure

Post WWII, the initial agreement among the Allies was that the division of the German territories would last only until a democratic government could be formed and that, up to that time, all the territories should be treated as one economic unity. In practice, however, the zones remained economically separate resulting in severe disruption of internal trading patterns and thus of industrial capability until the merging of the British with the American zone in 1947 and later the French zone in 1948.[29] The Soviet zone remained resolutely separate due to irreconcilable differences between the Allied leaders over reparations

[29] See for example, Alan Kramer, *The West German Economy 1945 – 1955*, (Providence R.I., Berg Publishers Ltd., 1991), pp 7 – 9

policy, prefiguring the eventual political and ideological partition of the country to leave one part functioning, at least notionally, as a liberal-capitalist democracy and the other as a socialist, Soviet satellite.

Development of West German Capitalism

The new political structure of West Germany owed much to the general distrust of powerful central state government and bureaucracy which had been such a feature of National Socialism, a distrust which was reinforced by the transition to communism happening in the East of the country.[30] Despite the British preference for the creation of a centralised state structured along British parliamentary lines, France favoured the decentralisation of power as a means to remove the potential for resurgent and aggressive Germany. The USA, however, favoured a strong federal structure with a functionally relatively weak centre as being the most favourable to the development of a private market economy, considered essential in maintaining a European bulwark against the spread of Communism. This corresponded to the ambitions of the right-wing Christlich Demokratische Union (CDU) in Germany which backed a decentralised fiscal structure, although the more left-wing Sozialdemokratische Partei Deutschlands (SPD) argued for a strong central structure fiscal control and only limited autonomy for the *Länder*.[31] The debate was rancorous, but the system which ultimately evolved was fiscally decentralised, with an independent central bank, constitutional court and powerful upper chamber of parliament (*Bundesrat*) with the power of veto which accorded the *Länder* decisive influence over virtually all matters of political importance and autonomy in areas such as economic policy, law, education and transport and communications. Thus, while the new system was effective in restraining the worst effects of partisan political competition, at the same time, it left West Germany with the considerable difficulty of trying to reach consensus between the federal government and all the individual *Länder* through "bargaining and amicable agreement" in the matter of national law-making.[32]

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[30] Phillip Manow, 'The Uneasy Compromise of Liberalism and Corporatism in Post-War Germany', Working Paper 5.88, January 1999, http://www.ciaonet.org/wps/map01/index.html, (accessed 4.5.2006), p 7

[31] Jeremy Leaman, *The Political Economy of West Germany, 1945 – 85*, (Basingstoke, MacMillan Press, 1988), pp 37 – 38

[32] Manow, 'The Uneasy Compromise of Liberalism and Corporatism in Post-War Germany', p 7; Phillip Manow and Simone Burkhart, 'Legislative Autolimitation under Divided Government: Evidence from the German Case 1976 – 2002', MPIfG Discussion Paper 04/11, (Max Planck Gesellschaft für Gesellschaftsforschung, Köln, November 2004), http://www.mpifg.de/pu/mpifg_ja/LSQ_32-07_Manow_Burkhart.pdf (accessed 14.3.2006); for a more extensive analysis see Peter J. Katzenstein, *Policy and Politics in West Germany: the Growth of a Semi-Sovereign State*, (Philadelphia, Temple University Press, 1987)

One issue on which there was general agreement among the Allies was the necessity to end the system of 'monopoly capitalism' which had existed in Germany previously. This was characterised by the existence of a number of large, price-fixing cartels and large, highly-concentrated concerns which, through the virtual elimination of competition distorted the self-regulating mechanisms of market cycles. These concerns had been severely implicated in the economic and social tribulations of the country during the Weimar era, the Great Depression and National Socialism. Moreover, they had arguably actively delayed the recovery of the country post-WWII through the hoarding of capital and allowed a relatively small number of industrialists to acquire great economic and, thus, political power.[33] Of the 2,500 officially sanctioned cartels and restrictive trade practice agreements which existed in the 1920s, over 1,000 were liquidated in the Western zones by 1948. The new political leaders of the Federal Republic of Germany proposed the concept of a 'social market economy' which would ensure optimal levels of competition by legal means, including strict anti-monopoly legislation. It has been argued, however, that the stance of the Western Allies owed a great deal more to a desire to weaken Germany's commercial development and restrict its presence on the international market.[34]

The economic system which eventually emerged, however, ultimately appeared to be little different than the previous one. Kramer argues that the resumption of cartelisation was, at least in part, attributable to the Korean War. The subsequent export boom led to bottlenecks in production because of lack of investment in new plant. At the same time as America was demanding a modification of the social market economy so that Germany could contribute to 'the defence of the free world', leaders of West Germany industry were again gradually acquiring the right to participate in the formulation of economic policy, ultimately leading to the revival of societal corporatism in an effort to expand capacity in the energy production, railway and coal, iron and steel sectors so vital to the rest of the economy.[35] Other factors also played a part in the revival of cartelisation, such as the impossibility of controlling the size of the industrial holdings of individuals, banks or corporations; the importance of the large companies in terms of foreign currency earnings, as providers of vital goods and products and their significance as local and regional employers; and, more cynically, the government's inability to control the increasing spread of illegal cartels.

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[33] Leaman, *The Political Economy of West Germany, 1945 – 85*, pp 48; 50; 58 – 59
[34] Kramer, *The West Germany Economy, 1945 – 1955*, p 115
[35] Kramer, *The West Germany Economy, 1945 – 1955*, pp 168 – 171

In any event, after 1957 the government again began to sanction the creation of formal cartels, such as those in the electrical and chemical industries, while becoming increasingly reluctant to prosecute illegal cartels. Moreover, over the decades since, these large companies and conglomerates have been supported by the federal government in times of economic downturn because of their significance for national prosperity and their role as large employers while also profiting from the difficulties of other, smaller firms.[36] This form of capitalism, then, hardly conforms to the pre-condition of full exposure of the economy to the marketplace considered optimal for the functioning of human capital development theory. Countering this to some extent, however, was West Germany's position in the centre of a stable and open intra-European trading area (the European Economic Community, later the European Union), which encouraged the need for competitive commercial behaviour and the development of networks of small and medium enterprises which were more flexible in response to market conditions.[37] West Germany has, thus, been characterised as a 'coordinated market economy', namely, one in which enterprises base their activities to a considerably greater extent on strategic interaction among firms and other actors, as opposed to 'liberal market economies' where activities are coordinated by competitive market arrangements, with supply and demand responding to the price signals thus generated. The co-ordinated market economy, arguably, also results in high levels of quality control because of good relations between workers and suppliers, thus ensuring comparative advantage in products for which quality is the demand driver rather than price.[38]

A further development in the social market economy was the autonomy of trade unions and employer associations when it came to industrial relations. One of its most identifiable features was and remains co-determination, or the representation of the workforce on the boards of firms. Designed to encourage conflict resolution through internal negotiation, from one point of view it proved to be "a benign and positive influence in the workplace" in that the information flow generated within the workplace helped to keep wage demands

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[36] Leaman, *The Political Economy of West Germany, 1945 – 85*, pp 55 – 56; 63 – 65

[37] See for example Gary Herrigel, *Industrial Constructions: The Source of German Industrial Power*, (Oxford, Oxford University Press, 2000), pp 143 – 150; Jean-Antoine Karagiannis, 'Ein Keim, der wachsen muß: German Antitrust as the first Europeanised Policy', http://www.epsnet.org/2004/pps/Karagiannis.pdf, (accessed 3.3.2007)

[38] Peter A. Hall and David Soskice, 'Introduction' in Peter A. Hall and David Soskice (eds), *Varieties of Capitalism: the Institutional Foundations of Comparative Advantage*, (Oxford, Oxford University Press, 2001), pp 8 – 9, p 44; Herrigel, *Industrial Constructions: The Source of German Industrial Power*, pp 173 – 175

in line with productivity growth and discouraged opportunistic behaviour.[39] It could be argued, moreover, that effective coordination between employers and trade unions can only enhance the economic performance of firms, while more stringent labour laws which guarantee greater job security encourage both greater company loyalty in the workforce and much greater investment in the training of the workforce on the part of the employer, thus enhancing the level of human capital in the firm. Conversely, both the intricacies of the coordinated market economy and the more stringent labour laws are accused of being responsible for a greatly lowered flexibility of response to fast-changing downturns in market conditions and hence, are frequently accused of hindering economic progress.[40]

The 'social' objective of the social market economy entailed the development of wide-ranging social protection, paid for through a tax burden which is heavier than that of most of Western Europe and the United States. Manow argues that the West German welfare state which has developed since WWII was, in effect, a direct continuation of that introduced by Bismarck prior to WWI. Workers and firms were legally forced into participation in accident and health insurance systems (*Körperschaften öffentlichen Rechts* or public law corporations). Whether state-run, labour-led or employer-led, insurance became obligatory under increasingly tight state regulation. State-enforced social insurance participation thus led to the integration of labour and capital into the state's administrative structure via the welfare state. This "proto-corporatism" arguably "laid the groundwork for the full-fledged corporatism of Weimar and adumbrated the main lines of West Germany's 'social partnership'".[41] Following the Second World War, while a new political equilibrium existed between the federal government and the *Länder* which precluded excessive political interference in decision-making by central government, the welfare system was restored along traditional corporatist lines, thus ensuring that coordination of the organised interests of capital and labour would be the drivers of the economy rather than any attempt to allow the liberal market capitalism free rein.[42]

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[39] See for example Volker R. Berghahn, *Modern Germany: Society, Economy and Politics in the Twentieth Century*, (Cambridge, Cambridge University Press, 1987), p 262

[40] Hall and Soskice, 'Introduction', in *Varieties of Capitalism*, pp 47 –50

[41] Steinmetz, quoted in Manow, 'The Uneasy Compromise of Liberalism and Corporatism in Post-War Germany', p 3; Werner Abelshauser makes a similar point in 'The First Post-Liberal Nation: Stages in the Development of Modern Corporatism in Germany', in *European History Quarterly*, Vol.14, No.3, 1984, p 287

[42] Manow, 'The Uneasy Compromise of Liberalism and Corporatism in Post-War Germany', p 7; see also Phillip Manow, 'Modell Deutschland as an Interdenominational Compromise', 8.5.99, Working Paper 00.3 for the Program of the Study of Germany and Europe, http://www.ces.fas.harvard.edu/publications/docs/pdfs/Manow.pdf, (accessed 4.5.2006)

If the institutional structure of the West German economy could be said to hark back to the pre-Weimar era, the same could also be said of the institutional framework of the higher education system which appeared after WWII, which is discussed in detail below. While this, in turn, also appears to fail to fulfil all the pre-conditions for a system of higher education which would facilitate the optimal development of human capital development for technical progress and economic growth detailed above, West Germany nevertheless managed to maintain a largely upward trajectory of economic growth over the period under consideration. This, then, gives rise to the question, firstly, of whether the more "liberal" pre-conditions for the encouragement of human capital development and economic growth are the sole means of doing so or secondly, whether economic growth in the FRG was actually dependent on an increase in human capital development achieved through the higher education system.

East Germany

While most scholars agree that, in the immediate aftermath of the war, while Stalin was certain as to the ultimate division of Europe and the world into East and West, it is also the case that he was unsure as to whether or not to retain East Germany as part of the Eastern bloc. In any event, because of disagreements with the Western Allies over reparations from the rest of the country, the Soviet zone was systematically pillaged, crippling the infrastructure and leaving much of industry incapable of functioning effectively.[43] Herrigel argues however, that that the loss of so much physical capital, much of which was worn and needed replacement, in no way diminished the technological potential of the area and may well have stimulated technological innovation.[44] Thus, initial economic recovery was swift, giving rise to Maier's contention that socialist economics was capable of functioning smoothly and efficiently.[45] If this is accepted, the question then remains of why the initial momentum was not maintained.

[43] See for example André Steiner, *Von Plan zu Plan: Eine Wirtschaftsgeschichte der DDR*, (München, Deutshce Verlags-Anstalt, 2004), pp 19 – 36; Derek H. Aldcroft, *The European Economy 1914 – 1990, 3rd Ed.*, (London, Routledge, 1996), pp 169 – 172; Reinhard Pohl (ed.), *Handbook of the Economy of the German Democratic Republic*, (translated Lux Furtmüller), (Farnborough, Saxon House, 1977), pp 1 – 2; Hans Apel, *Wehen und Wunder der Zonenwirtschaft*, (Köln. Verlag Wissenschaft und Politik, 1966), p 18

[44] Herrigel, *Industrial Constructions: The Source of German Industrial Power*, p 206; Jeffrey Kopstein makes a similar point in *The Politics of Economic Decline in East Germany, 1945 – 1989*, (Chapel Hill, The University of North Carolina Press, 1997), pp 19 - 24

[45] Charles Maier, *Dissolution*: *The crisis of Communism and the End of East Germany*, (Princeton, Princeton University Press, 1997), p 81

The main features of the socialist economic system were linked to and driven by Marxist-Leninist ideology. The economy was controlled by a single, very hierarchical party in which every level was required to ensure the compliance of the level below it with instructions received from the level above; the basic means of production were were owned collectively by the 'people' or *Volk*, which in practice meant the state. Thus, the main lines of economic policy which determined regional and sectoral policy were decided by party organs at state level, including the level of investment in every sector of economic activity. The main coordinating mechanism of the economy, indeed of the whole of society, was compulsory central planning. Economic planning was organised by the State Planning Commission, set up in 1950. It defined long-term aims covering a period of years, examined existing capacities, and, in theory at least, identified the changes and the amount of development needed to achieve the targets. From these were developed shorter-term yearly plans. The first two-year plan, 1949 – 1951, was followed by two five-year plans till 1960, then two seven-year plans covering 1959 – 1970, and finally three five-year plans reaching into the mid-1980s. Although the limited use of some market instruments did intrude into this system at times during the life of the regime, for example, in the form of the New Economic System introduced in 1963, they only ever played a very minor role.[46]

One of the most striking features of East German governance was the level of bureaucracy which pervaded the whole system. In the absence of market signals, the mechanisms of coordination were undertaken by a number of agencies including the Office of Prices which determined wholesale and retail prices, the Investment Bank, the Labour Office and agencies for material and technical supplies, the function of which was to bring together buyers and sellers in the production and distribution process. State bureaucracy was also responsible for the management of the enterprises.[47] Productivity targets were set for workforces and, if exceeded, were rewarded by financial bonuses and political rewards.[48] Aldcroft argues that the lack of a private sector meant that the system was relatively easy to implement despite its increasingly obvious and manifold inefficiencies.[49] There was, for example, an overemphasis on the quantitative fulfilment of the Plan targets without regard

[46] Marie Lavigne, *The Economics of Transition: from Socialist Economy to Market Economy, 2nd Ed.*, (Basingstoke, Palgrave, 1999), pp 3 – 5; Aldcroft, *The European Economy 1914 – 1990, 3rd Ed.*, pp 171 – 172; Stephen F. Frowen, 'The Economy of the German Democratic Republic' in David Childs (ed.), *Honecker's Germany*, (London, Allen & Unwin Ltd., 1985), pp 34 – 37
[47] Lavigne, *The Economics of Transition: from Socialist Economy to Market Economy*, pp 5 – 6
[48] Jeffrey Kopstein, *The Politics of Economic Decline in East Germany, 1945 – 1989*, (Chapel Hill, The University of North Carolina Press, 1997), pp 24 – 29
[49] Aldcroft, *The European Economy 1914 – 1990, 3rd Ed.*, p 171

for product quality; the encouragement of growth through increasing inputs of labour and capital resulted in diminishing returns to investment; investment resources were often arbitrarily (mis)allocated; resources including labour, were hoarded; there were serious imbalances in the sectoral development of the country; and corruption and 'working the system' became endemic. The even more intensive centralisation of industry in the 1970s through the grouping together of firms to form large, vertically integrated combines (Kombinate) in order to improve efficiency and prevent manufacturing bottlenecks, reduced competition even further and, instead of the desired result, produced over-bureaucratic, unwieldy monoliths lacking in innovation and enterprise.[50]

Despite also being a member of a supra-national trade organisation in the form of Comecon (also known as the Council for Mutual Economic Assistance or CMEA), the secure market for products there, accompanied by the virtual absence of competition, meant there was little impulse to improve industrial performance.[51] Manufacturing in the Comecon countries remained largely autarchic and arbitrarily and irrationally planned, militating against the development of trade, manufacturing and industry along the lines of comparative advantage. A number of attempts to reform Comecon, for instance by introducing supranational agencies responsible for planning production and trade, were resisted strongly by national politicians and apparatchiks unwilling to surrender power to economic planners at supra-national level which would inevitably prioritise the needs of the Soviet Union as the largest country in the group.[52]

The signs, therefore, did not augur well for the optimal development of human capital; although in terms of higher education, as will be explained in the following section, the nation did its utmost to promote those sectors which were most closely aligned with economic growth. What follows is a review of the historiography of the development of higher education in Germany, with particular emphasis on scientific and technical education.

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[50] Aldcroft, *The European Economy 1914 – 1990, 3rd Ed*., pp 185 – 186; Kopstein, *The Politics of Economic Decline in East Germany*, pp 24 – 29, 34 – 39; Apel, *Wehen und Wunder der Zonenwirtschaft*, pp 25 – 27; Pohl, Handbook of the Economy of the German Democratic Republic, p 7

[51] Gert Leptin and Manfred Melzer, *Economic Reform in East German Industry*, (translated by Roger Clarke), (Oxford, Oxford University Press, 1978), pp 7 – 8

[52] Robert Bideleux, 'The Comecon Experiment', in Robert Bideleux and Richard Taylor (eds), *European Integration and Disintegration*, (London, Routledge, 1996), pp 174 – 190

Higher Education Historiography

Both East and West Germany were heirs to the same system of higher education which had existed before the Second World War which, ostensibly at least, was patterned on the Humboldtian principles of the freedom and unity of teaching and learning which saw the primary function of higher education as being the development of the individual personality. However, insofar as professional training was concerned, while university education had traditionally prepared successive new generations of clergymen, lawyers, doctors, academics and government bureaucrats, utilitarianism in the form of training for the industrial or commercial sectors was regarded as being devoid of *Geist* (intellectual significance) and therefore not in the remit of academia.[53] Moreover, a strong picture of organisational inertia and strong resistance to the industrialisation of the country within academia emerges from the literature on this period,[54] even as the development of technical education in Prussia and the birth of the *Technische Hochschulen* during the 19th century mirrored Germany's change from a largely agrarian to an industrial nation.

By the beginning of the 20th century Germany had achieved an international reputation for scientific and technological excellence. It is open to question, however, whether this was solely the result of the high degree of scholarship created by the traditions of *Wissenschaft* (scholarship) and *Bildung* (cultivation) within the universities. Given the exclusive focus on basic research in the universities, the translation of this into the high technology products for which Germany was famous was surely the result of applied research conducted elsewhere, either in the *Technische Hochschulen* which had achieved university-level status at the end of the 19th century, in research institutions outwith university, or by industry in the workplace.[55] An alternative suggestion is that other factors

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[53] Fritz K. Ringer, *The Decline of the German Mandarins: The German Academic Community, 1890 – 1933*, (Hanover New England, Wesleyan University Press, 1969), pp 104 – 106

[54] See for example, Ringer, *The Decline of the German Mandarins*, Joseph Ben David, *The Scientist's Role in Society: a Comparative Study*, (Englewood Cliffs N.J., Prentice-Hall Inc., 1971); *Centers of Learning: Britain, France, Germany, United States*, (New York, McGraw-Hill, 1977)

[55] Alan Beyerchen, 'On the Stimulation of Excellence in Wilhelmian Science', in Jack R Dukes and Joachim Remak (eds), *Another Germany: a Reconsideration of the Imperial Era*, (Boulder and London, Westview Press, 1988), pp 139 – 140; Robert R. Locke, in *The End of the Practical Man: Entrepreneurship and Higher Education in Germany, France and Great Britain 1880 - 1940*, (Greenwich, Conn., Jai press Inc., 1984) argues that the high rates of economic development at the end of the 19th and beginning of the 20th centuries were largely attributable to the quantity and quality of training offered in the Technische Hochschulen; Kees Gispen, *New Profession, Old Order: Engineers and German Society*, 1815 – 1914, (Cambridge, Cambridge University Press, 1989), argues that the rift between *Technik* and *Bildung* was so unbridgeable that the technically educated were forced to compete with, rather than join the established academic order and that this competition was responsible for the development of a globally recognised standard of technological excellence and attendant economic achievement on one hand, and for the entrenchment of resistance to change on the other

were at play, such as competition between universities for the best researchers which forced a degree of flexibility on the academic scientific establishment[56] and even competition between the federal states.[57]

West Germany

Resistance to change remained a feature of traditional academia, exacerbated by the power of the university senates in influencing decisions regarding the introduction of structural and curricular change and the difficulties in operation of the complex, federalised, joint decision-making process responsible for educational policy. Academics in the more traditional universities dismissed *Technische Hochschulen*, along with more recently created universities, as producing only empty educational routine lacking in creative scholarship despite their increasing incorporation of faculties of liberal arts and philosophy.[58] However, the teaching bodies in the *Technische Hochschulen* increasingly associated themselves with the existing elite *Bildungsbürgertum* (intellectual middle classes) and had adopted the same autonomous governing structures and attitudes as the traditional universities.[59] Moreover, with the obvious exception of those expelled under National Socialism, there was remarkable continuity in personnel from the period of the Weimar Republic, through Hitler's Third Reich and even into the new Federal Republic. This continuity in personnel also represented a continuity of attitudes to the point where it was suggested that *Lehr- und Lernfreiheit* had "become perverted into a state of anarchy tempered by professional tyranny"[60] by the conservative and reactionary nature of German academia.

By the end of WWII, however, German university education and scientific accomplishment were considered considerably inferior to that of the USA. While long term underfunding, scientific isolation and the academic and scientific policies of the National Socialists were factors in this, the innate conservatism and elitism of the system during the Weimar period and in the decades following the war must also be considered as

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[56] Joseph Ben-David, *The Scientist's Role in Society: A Comparative Study*, (Englewood Cliffs NJ, Prentice-Hall, 1971), p 133

[57] Schimank Uwe and Meier Frank, Förderinitiative des BMBF: Science Policy Studies, Expertise zum Thema: 'Neue Steuerungssysteme an den Hochschulen', 31.05.2002, http://www.sciencepolicystudies.de/dok/expertise-schimank.pdf (accessed 4.12.2005)

[58] Steven P. Remy, *The Heidelberg Myth: the Nazificaton and Denazification of a German University*, (Cambridge, Mass., Harvard University Press, 2002); see also Fritz K. Ringer, *Education and Society in Modern Europe*, (Bloomington and London, Indiana University Press, 1979)

[59] Gispen, *New Profession, Old Order*, pp 223 – 228; see also Kees Gispen, *Poems in Steel*: *National Socialism and the Politics of Inventing from Weimar to Bonn*, (New York, Berghahn Books, 2002), p 4

[60] Harald Huseman, 'Anglo-German Relations in Higher Education' in Arthur Hearnden (ed.), *The British in Germany: Educational Reconstruction after 1945*, (London, Hamish Hamilton, 1978), pp 158 – 173

prime causes. Issues raised by the literature include the inability and/or unwillingness of the *Hochschulen* to turn the results of fundamental research to practical ends. Because, in this sense, investment in higher education could be seen as a non-productive investment, this may have become a factor in limiting government expenditure in the sector, thus exacerbating the problem.[61] Another issue relates to the elitist nature of higher education and whether the maintenance of the status quo was justifiable on social, political or economic grounds, especially in the light of an impending demographic boom. A system which so strongly disadvantaged females, working class, rural and Catholic children also represented a failure to tap a huge reserve of latent talent for economic gain.[62]

Given that, at around six percent, the proportion of an age cohort being educated to *Abitur* level and going on to higher education was considerably lower in West Germany than in any other industrialised country in the world, the question arises of whether the quantity of graduates being produced was sufficient to cope with the pace of scientific and technological development.[63] Nevertheless, West Germany underwent a spectacular post-war economic boom during the 1950s and 1960s, arguably negating the argument that more higher education was necessary for economic growth particularly in view of the expanding needs of industry for lower-skilled labour.[64] However, as in all developed states, the number of jobs for which a higher education was necessary was growing faster than the number with such an education and in Germany the discrepancy appeared to be particularly sharp.[65] Related to this there is the question of whether the subjects offered and the level of teaching were adequate to cope with the pace of scientific and technological development, particularly in view of the mounting pressure from industry for a much greater emphasis on technical education and increasing technological specialisation within higher education.

Despite objections from those who wished to reserve university education for a small intellectual elite, the reform of the education system in the mid-1960s encouraged a substantial expansion of the student body, the development of unified academic programmes across the country, the building of a number of new higher education

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[61] Joseph Ben David, *OECD Fundamental Research and the Universities: Some Comments on International Differences*, (Paris, OECD, 1968)
[62] Ralf Dahrendorf, *Bildung ist Bürgerrecht: Plädoyer für eine active Bildungspolitik*, (Hamburg, Nannen-Verlag, 1965)
[63] Georg Picht, *Die deutsche Bildungskatastrophe*, (Olten und Freiburg im Breisgau, Walter-Verlag, 1964), p 14, p 16, pp 20 - 30
[64] For a more detailed discussion of this see Teichler, Hartung and Nuthmann, *Education and the Needs of Society*, p 37
[65] Picht, *Die deutsche Bildungskatastrophe*, p 66

institutions and the inclusion of more professional courses of study, as well as recommendations for the inclusion of engineering faculties at all universities.[66] Nevertheless, by the end of the 1960s economic growth was markedly slowing and the government becoming increasingly concerned about the growing gaps in technology between West Germany and the USA. This begs the question of whether these issues were related to insufficiently radical reform measures in higher education, the perpetuation of academic obduracy and public resistance to a change in the function of higher education, or whether other factors were at play such as ineffective management within industry, resistance from social partners and failure to invest sufficiently in either higher education or research and development. At the same time, however, West Germany's performance in a number of more traditional research-intensive industries such as chemicals and pharmaceuticals remained very strong and internationally competitive,[67] proving that scientific excellence and technological progress were achievable. My thesis aims to explore the main factors influencing economic and technological development in West Germany and, in particular, the role of higher education in both the failure to close the gaps in technology and in the scientific and technological success stories.

It was not until the early 1970s that student numbers expanded to the extent that the term *Massenuniversitäten* (mass universities) came into play. Much of the literature on higher education from the 1970s and 1980s discusses the structural problems incurred through this such as the difficulties of funding the rapidly mushrooming sector in a steadily worsening economic climate.[68] The issues of institutional overcrowding and the consistently increasing average duration of study were another focus for debate as was the fear that the exigencies of teaching ever-increasing numbers would disrupt the balance of the 'unity of research and teaching' to compromise the performance of the pure theoretical research which was seen as crucial to academic training and intellectual growth.[69] The 'unity of

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[66] Walter Hahn, 'Higher Education in West Germany: Reform Movements and Trends' in *Comparative Education Review*, Vol.7, No.1, 1963, pp 51 – 60

[67] Werner Abelshauser, 'Das Produktionsregime der chemischen Industrie im sozialen Produktionssystem der deutschen Wirtschaft des 20. Jahrhunderts', in Rolf Petri (ed.), *Technologietransfer aus der deutschen Chemieindustrie (1925-1960)*, (Berlin: Duncker & Humblot, 2004), p 53

[68] See for example, Carl Christian Von Weizsäcker, 'Problems in the Planning of Higher Education' in *Higher Education*, Vol.1, No.4, 1972, pp 391 – 408 in which he proposes that a market model of higher education involving fees and a state credit scheme with repayments via a graduate tax as being socially equitable, more likely to result in the choosing of shorter and cheaper courses of study and more flexible to changes in labour market demands; Ulrich Karpen, 'Organisation and Procedures for Funding Higher Education in the Federal Republic of Germany', *Higher Education in Europe*, Vol.10, No.1, 1985, pp 114 – 123

[69] See for example Klaus-Dieter Grunwald, 'Academic Counselling in the Federal Republic of Germany: 10 Pilot Schemes Evaluated', *Higher Education in Europe*, Vol.7, No.2, 1982, pp 68 – 72; Oliver Fulton, 'Needs, Expectations and Responses: New Pressures on Higher Education' in *Higher Education*, Vol.13, No.2, 1984, pp 193 – 223; Walter Hahn, 'Upward Academic Mobility for the Non-Secondary School

research and teaching' was described as the "Achilles heel" of research in the *Hochschulen*.[70] This was in part because of the extreme reluctance of the *Hochschulen* to increase the flexibility of their traditional institutional structure and make it more adaptable to changing circumstances even as the economic situation intensified the pressure on them to be more accountable in terms of research, to contribute both directly and indirectly to the promotion of innovation and to increase efforts in interdisciplinary, cross-disciplinary and inter-institutional research, in both basic and applied fields.[71] Closely related to this was the lack of competition between institutions following the reform, which in the past had been credited as responsible for Germany's former stellar international academic reputation by encouraging specialisation and competition for the best researchers and students. These factors, in turn, encourage questions as to the effectiveness and even the viability of the collective decision-making process responsible for the development of educational and research policy, which it is argued has consistently operated as a blocking mechanism to change.[72] The main questions arising from these developments, which my thesis will address, concern firstly the effect of such rapid expansion on the quality of teaching and scholarship in the *Hochschulen*; and secondly, why the *Hochschule* candidates were so reluctant to move away from what was perceived to be the 'traditional' academic path of the humanities, philosophy in particular, and embrace more technical specialties conforming to labour demand. Thirdly, it will explore the how the policy-making process affected the ability of higher education to adapt and change.

The problem of employing large numbers of graduates gained even greater significance through the 1970s and 1980s as the saturation of traditional graduate employment markets led to even stronger pressure for a more technological focus and more vocationally

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Graduate: some Avenues Open to Young Adults in West Germany', in *Higher Education*, Vol.9, No.1, 1980, pp 7 – 20; Günther Kloss, 'The Academic Restructuring of British and German Universities and Greater Efficiency: A Comparative Perspective', *Oxford Review of Education*, Vol.11, No.3, 1985, pp 271 – 282

[70] Uwe Schimank, *Hochschulforschung im Schatten der Lehre*, (Frankfurt, Campus Verlag, 1995), especially pp 15 – 30

[71] See for example, Rudolf Wildenmann, 'Situation of Teaching and Research Personnel in the Federal Republic of Germany – Report presented at the CRE Conference', reprinted in *Higher Education in Europe*, Vol.3, No.3, pp 15 – 17; Mircea Malita, 'Universities as Centres of Research', *Higher Education in Europe*, Vol.5, No.2, 1980, pp 34 – 38; Valentin von Massow, 'Organization and Promotion of Research (in particular, University Research) in the Federal Republic of Germany', *Higher Education in Europe*, Vol. 6, No.2, 1981, pp 14 – 16; Ulrich P. Ritter, 'New Tasks and Functions for Higher Education by the Year 2000', *Higher Education in Europe*, Vol.9, No.2, 1984, pp 61 – 68

[72] Helga A. Welsh, 'Disentangling the Reform Gridlock: Higher Education in Germany', Working Paper 02.7, Program for the Study of Germany and Europe, Wake Forest University, 2001, http://www.ces.fas.harvard.edu/publications/docs/pdfs/Welsh02.pdf (accessed 14.3.2006); for a more general discussion on the joint-decision process see Fritz W. Scharpf, 'No Exit from the Joint-Decision Trap? Can German Federalism Reform Itself?', Max Planck Institute for the Study of Societies, Working Paper 0005/8, September 2005, http://www.mpifg.de/pu/workpap/wp05-8/wp05-8.html (accessed 14.3.2006); Manow and Burkhart, 'Legislative Autolimitation under Divided Government: Evidence from the German Case 1976 – 2002'

oriented courses in the *Hochschulen*.[73] One of the main questions to be addressed is how students' subject choices affected their employment opportunities and what the impact of the absorption of so many humanities-trained graduates had on the employment market and the economy. With reference to the arguments presented in the overeducation debate, my thesis will analyse the development of the graduate employment situation and how it affected the academic choices of students.[74] Stemming from the first two questions is a third. Despite West Germany's laggardly attitude to the adoption of a more economically pragmatic approach to higher education design in contrast to East Germany, economic growth continued, albeit at a considerably slower pace after 1970, and innovation and progress carried on apace in a number of areas of technology. The big question to be answered, therefore, and the purpose of this thesis, revolves around higher education's real relevance to economic growth in West Germany.

East Germany

Much of the historiography of higher education in East Germany understandably focuses on the revisionist reforms enacted in order to achieve the sovietisation of the system. One strand of the literature stresses that these were undertaken in order to ensure the development of modern socialist personalities,[75] while another argues rather that the reforms represented the attempt to mobilise university education as one component in the drive for increased economic productivity,[76] although in government rhetoric the two were generally declared as being inextricably interdependent. Hence, because the ideal socialist personality allegedly found personal fulfilment only in the fulfilment of the greater

[73] See for example Teichler, Hartung and Nuthmann, *Education and the Needs of Society*, especially chpts. 1&2; Teichler and Sanyal, *Higher education and the labour market in the Federal Republic of Germany*, especially chpts. 1&2; Bikas C. Sanyal, 'Higher Education and Employment in Europe: Some Selected Issues', *Higher Education in Europe*, Vol.13, No.1, pp 43 – 53; Jürgen Schramm, 'Development of Higher Education and Employment in the Federal Republic of Germany', in *Higher Education*, Vol.9, No.5, 1980, pp 605 – 617; Christoph Oehler and Ulrich Teichler, 'Changing Approaches to Planning in Higher Education in the Federal Republic of Germany', *Higher Education in Europe*, Vol.9, No.1, 1.1.84

[74] Of particular interest in this respect are two independent studies reflecting changing student motivation: Johann-Ulrich Sandberger and Georg Lind, 'The outcomes of university education: some empirical findings on aims and expectations in the Federal Republic of Germany', *Higher Education*, Vol.8, 1979; and Hansgert Peisert, 'Students in the Federal Republic of Germany: Diversity in Motives and Prospects', *Higher Education in Europe*, Vol.10, No.1, 1985, pp 18 – 29

[75] See for example Horst Siebert, 'Auf dem Weg zum neuen Menschen – Pädagogik und Bildungspolitik in der DDR', in Peter Christian Ludz (ed.), *Wissenschaft und Gesellschaft in der DDR*, (Munich, Carl Hanser Verlag, 1979), pp 78 – 121; John Page, 'Education under the Honeckers', in David Childs (ed.), *Honecker's Germany*, (London, Allen and Unwin, 1985), pp 55 – 58

[76] Hubert Laitko, 'The Reform Package of the 1960s: the Policy Finale of the Ulbricht Era', in Kristie Macrakis and Dieter Hoffman (eds), *Science under Socialism: East Germany in Comparative Perspective*, (Cambridge Mass., Harvard University Press, 1999), p 56

societal, political and economic interests,[77] the traditional idea of higher education solely for individual personal development was rendered largely obsolete. It became instead an instrument for the reproduction of ideologies and the creation of good socialist personalities; for democratisation and the development of a proletarian technical elite; and above all, for the rigid direction of training and education in conformity with economic and ideological priorities.[78] Thus, funding for higher education was overwhelmingly directed from the humanities to technical subjects and ever more narrowly specialised technical disciplines were introduced and taught through nationally standardised curricula, while political and ideological adherence was frequently prioritised over academic competence when it came to staffing the *Hochschulen* and selecting the students.

One question to be addressed, however, is whether the discontinuities thus created permitted the wholesale adoption of the new higher education system and a closer identification with the new regime. Alternatively, did the practical difficulties created through denazification and the competition with West Germany for the talents of the professoriate, at least until 1961, result in enduring continuities with the previous system becoming embedded in the new one?[79] If so, how did this affect the functioning of the system envisaged by the East German authorities? My thesis will analyse the effects on the quality of teaching and research both of this and of the appointment of large numbers of under-qualified professors with little or no prior academic experience following denazification. Secondly, it will consider how industry increasingly became the frame of reference for most of the technical universities. More specifically, it reflects on the pressure placed on the academic sector to work in close collaboration with local industry in order to supply graduates suitably trained to work in specific positions in industry,[80] and in the pursuit of innovative activity leading to increased productivity.

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[77] See for example Siebert, 'Auf dem Weg zum neuen Menschen – Pädagogik und Bildungspolitik in der DDR', pp 208 – 209; Manfred Nast, 'Right to Education and the Tasks of Higher Education in the GDR', *Higher Education in Europe*, Vol.1, No.2, 1977, pp 25 – 27

[78] John Connelly, *Captive University: the Sovietization of East German, Czech and Polish Higher Education 1945 – 1956*, (Chapel Hill and London, The University of North Carolina Press, 2000); for more discussion on this see also Thomas H. Baylis, *The Technical Intelligentsia and the East German Elite: Legitimacy and Social Change in Mature Communism*, (Berkeley, University of California Press, 1974), pp 36 – 61

[79] Connelly contests this, however it is supported by Ralph Jessen, *Akademische Elite und Kommunistische Diktatur: die ostdeutsche Hochschullehrerschaft in der Ulbricht-Ära*, (Göttingen, Vandenhoeck und Ruprecht, 1999), part B especially pp 38 - 95; Naimark echoes this for the period up to 1949 in chpt. 8 'The Politics of Culture and Education' in Norman M. Naimark *The Russians in Germany*, (Cambridge, Mass., Belknap Press, 1995); see also Dolores Augustine, *Red Prometheus: Engineering and Dictatorship in East Germany, 1945 – 1990*, (Cambridge Mass., MIT Press, 2007), pp 51 – 60 who argues that some of the continuities lasted throughout East Germany's existence

[80] Augustine *Red Prometheus*, p 58; see also Bentley, *Research and Development in the Former German Democratic Republic*, p 92

Most commentators agree that the passage of the Third Higher Education Reform Bill in 1968 finally established centralised control over every aspect of higher education and successfully achieved the re-orientation of a whole new generation of university teachers. In so doing, however, the literature raises the issue of whether this finally eradicated much of what would have enabled the East German universities to compete on a par with those of the West.[81] One question which will be considered by this thesis is what effect the increasing emphasis on socialist ideology had on the curricular content, the structure of university education and level of academic achievement. A second is how significantly the wide-ranging research relevant to the national economic priorities of international-level technological progress and economic growth was affected by tying the output of higher education institutions and their research agendas even more closely than previously to the needs of local industries.[82] A third concerns technology transfer and how effectively this was fostered and facilitated for the benefit of the economy. Given that the economic evidence would appear to argue that it was not, the question to be addressed is why and what factors may have contributed to the problem?

Fourthly, graduate employability became an issue. Despite the close links forged between higher education and industry and rigorous education and manpower demand planning,[83] overeducation appeared to be as prevalent in the GDR as in the FRG. Disparity between qualification and employment was apparent at all levels but particularly so among graduates.[84] The disparity worsened when change of leadership in 1971 brought about the de-emphasis of the pursuit of the scientific-technological revolution. The result was an attempt to adjust supply to workplace demand by restricting access to higher education and prioritising lower-level vocational training.[85] The questions arising with regard to this,

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[81] This point is made by Eckhardt Förscht in 'Science, Higher Education, and Technology Policy' in Macrakis and Hoffman (eds), *Science under Socialism*, pp 41 – 42; a similar argument is presented by Manfred Rexin, 'Die Entwicklung der Wissenschaftspolitik in der DDR' in Peter Christian Ludz (ed.), *Wissenschaft und Gesellschaft in der DDR*, (Munich, Carl Hanser Verlag, 1979), pp 78 – 121

[82] Raymond Bentley, *Research and Development in the Former German Democratic Republic*, pp 82 – 86 argues strongly that it did; for an opposing viewpoint from the GDR perspective see H. Irmer and B. Wilms, 'New Forms of Co-operation for Research in the German Democratic Republic between Higher Education Institutions and Industry' in *Higher Education in Europe*, Vol.9, No.4, 1984, pp 35 – 40

[83] See for example Sachse, 'Manpower Planning and a Programme of Higher Education Development in the German Democratic Republic', pp 3 – 5

[84] See for example. Baylis, *The Technical Intelligentsia and the East German Elite: Legitimacy and Social Change in Mature Communism*, pp 45 – 46; Bentley, *Research and Development in the Former German Democratic Republic*, pp 93 – 94; Augustine, *The Red Prometheus*, pp 78 – 85; Anna-Jutta Pietsch, 'Reaktionen im Ausbildungs- und Beschäftigungssytem auf Probleme der Bildungsexpansion in der DDR under UdSSR', in Oskar Anweiler and Friedrich Kuebart (eds), *Bildungssyteme in Osteuropa Reform oder Krise?*, (Berlin, Berlin Verlag Arno Spitz, 1983), pp 216 – 218

[85] See for example Oskar Anweiler, 'Bildungssysteme in Osteuropa – Reform oder Krise?', p 14 and Dietmar Waterkampf, 'Das Einheitlich Bildungssytem der DDR in den Siebziger Jahren', in Anweiler and Kuebart (eds), *Bildungssysteme in Osteuropa – Reform oder Krise*, pp 49 – 50, 54; for the official GDR position on

covered in the thesis, concern the effects of restricted entry to higher education on the general educational level of the country,[86] its scientific, technological and economic performance[87] and on the general morale and perceptions of the populace.[88] On a different tack is the question of why so many graduates found it difficult to obtain suitable employment when the need for continually increasing numbers had previously been seen as critical and had been planned for. [89]

The restrictions on higher education lasted only until the late 1970s when the leadership's emphasis shifted to research into, and the production of, high technology. In order to achieve the necessary scientific and technical capabilities for this policy, GDR commentators again began to stress the obligation of a 'developed socialist society' to consistently raise the level of education of the population.[90] While this approach arguably largely conforms to the theory of human capital development, it is certainly open to question whether the GDR was really subscribing to the philosophy, or was simply increasingly aware of the need to maximise the available potential of a declining population in order to meet its goals in terms of productivity and in the achievement of international standards in the high technology sector. In the event, despite strenuous attempts to maximise the economic applicability of higher education, the economy failed catastrophically. The point to be addressed, then, is to what extent the higher education system could be said to have contributed to this, or whether the blame lay elsewhere.

I will attempt to assess the real relevance of both the East and West German systems of higher education to economic performance and compare the two to assess parallels and

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this see Werner Wolter, 'Contemporary Approaches to the Planning of Higher Education', in *Higher Education in Europe*, Vol.9, No.1, 1984, pp 21 – 22; Sachse also argues that the synchronisation of educational change with long-term educational planning had been achieved in 'Manpower Planning and a Programme of Higher Education Development in the German Democratic Republic', p 3

[86] See for example Anna-Jutta Pietsch, 'Reaktionen im Ausbildungs- und Beschäftigungssystem auf Probleme der Bildungsexpansion in der DDR und der UdSSR', pp 216 – 218

[87] See for example Siegfried Baske, 'Die Konzeptionen der Hochschulpolitik und Hochschulgestaltung in der DDR und in der Volksrepublik Polen', in Anweiler and Kuebart (eds), *Bildungssysteme in Osteuropa – Reform oder Krise*, p 297; Steiner, *Von Plan zu Plan*: *Eine Wirtschaftsgeschichte der DDR*, p 180

[88] See for example Margrete Siebert Klein, *The Challenge of Communist Education*, (New York, Columbia University Press, 1980), p 79; Waterkampf, 'Das einheitliche Bildungssytem der DDR in den siebziger Jahren', p 54

[89] Raymond Bentley, *Research and Technology in the former German Democratic Republic*pp 93 – 94; André Steiner, *Von Plan zu Plan: Eine Wirtschaftsgeschichte der DDR*, (Munich, Deutsche Verlags-Anstalt, 2004), p 180; Dolores L. Augustine, *The Red Prometheus*, pp 298, 322

[90] See for example, Manfred Nast, 'Right to Education and the Tasks of Higher Education in GDR', pp 25 – 27; Heinz Haas, 'Information on some Non-Traditional Forms of Higher Education in the German Democratic Republic', in *Higher Education in Europe*, Vol.3, No.4, 1978, pp 15 – 16; Willi Wolter, 'Higher Education and Lifelong Learning in the German Democratic Republic', in *Higher Education in Europe*, Vol.4, No.4, 1979, pp 20 – 21; H.J. Schulz, 'The Development of Higher Education in the GDR in the Eighties', in *Higher Education in Europe*, Vol.6, No.2, 1981, pp 50 – 54; Werner Wolter, 'Contemporary Approaches to the Planning of Higher Education', pp 21 – 24

differences in the way in which higher education influenced the economies of the respective countries.

Comparative Literature

There currently exists very little literature comparing aspects of higher education in East and West Germany, and that which does exist, while informative and relevant to this thesis, has a rather different focus. For instance, Arthur Hearnden provides a direct comparison of the development of the education systems of both countries from 1945 – 1972.[91] The work highlights the institutional and curricular changes dictated by the divergent social and political development of the states, using these to draw parallels with the development of communist and non-communist states in general. The main focus, however, is on primary, secondary and lower-level tertiary education with, inexplicably, very little attention devoted to higher-level education and thus to the implications that ideologically driven reform had for the innovative technological advance and economic growth which are at the heart of my work. Koeshall also adopts a sociological approach, albeit one which focuses considerably more heavily on higher education. In an exhaustive pedagogical and social analysis comparing curricula and education styles, he concludes that a Marxist-Leninist education had a markedly deleterious effect on the critical thinking abilities of East German students in relation to those of their West German counterparts.[92] Koeshall's work, however, also stops short of drawing inferences as to the effect of the differently structured educational methods on the push for scientific and technological innovation and development.

In contrast, Ash's 1999 study[93] focuses exclusively on scientific communities and the continuities and discontinuities in those of East and West Germany as a result of political upheaval. The work concentrates on the response of both the extra-academic and academic scientific communities to the new social and political constructs emerging from 1933, 1945 and 1999. He reinforces a point made in much of the general historiography of German higher education of the instinct for self-preservation of the professoriate and its struggle to

[91] Arthur Hearnden, *Education in the Two Germanies*, (Oxford, Basil Blackwell, 1974)
[92] John Frederick Koeshall, 'The Effects of the Marxist-Leninist Educational System on the Thinking Abilities of East German Students', PhD submitted to the School of Intercultural Studies, Biola University, 2002
[93] Mitchell G. Ash, 'Scientific Changes in Germany 1933, 1945, 1990: Towards a Comparison', *Minerva*, Vol.37, 1999, pp 329 – 354; Ute Deichmann makes a similar point for the periods following 1933 and 1945 in 'Chemists and Biochemists during the National Socialist Era', in *Angewandte Chemie International Edition*, Vol. 41, 2002, pp 1310 – 1328, relating this particularly to the resultant backwardness of German science, particularly in bio-, physical and quantum chemistry

maintain, or reconstruct itself as an autonomous elite. Nevertheless, he has little to say with regard to changes in university structure and ethos, or the practical consequences in terms of technological progress and economic growth which form the basis of my thesis and which are very much the focus of Raymond Bentley's studies on technological change in the GDR.[94] Bentley's work, however, cannot be considered a true comparison of East and West as West German statistics are used only as a yardstick against which to measure East German progress; the core analysis is of the East German case.

This brief overview of the literature serves to highlight how the more important issues related to human capital development theory manifested themselves in both East and West Germany within two very distinctive approaches to the shifting dynamic between *Bildung* and *Technik.* To present a simple comparison of the two countries, however, would fail to do justice to the infinite complexities of such an influential sector of society and the economy. It has been argued that "comparison does not and cannot mean emphasising similarities at the expense of differences…the aim is to establish both…in order to explain them as precisely as possible".[95] My study aims to explain, in the light of contemporary economic and political developments, both the more overt differences and a surprising number of parallels in policy design and objectives in both countries despite their very different *Weltanschauungen (world views).*

Methodology

My initial plan for this project was to provide a detailed comparison of the effects of the higher education policies in both countries based on a limited number of case studies of higher education institutions. Because of the very diverse historical development of the different types of higher education institutions, both pre- and post-war, however, I planned to draw on the experiences of a traditional university and of a technical university/*Technische Hochschule* in each country. The examples I proposed to use in the West were the University of Heidelberg and the *Technische Hochschule* Aachen, and in the East the Humboldt University in Berlin and the *Technische Universität* Dresden. In addition to their divergent origins, the two Western examples were subject to different social and political pressures after WWII resulting from their geographical location in

[94] Bentley, *Technological change in the German Democratic Republic*, (Boulder, Col., Westview Press, 1984); and *Research and Technology in the Former German Democratic Republic*, (Boulder, Col., Westview Press, 1992)
[95] Mitchell G. Ash, 'Scientific Changes in Germany 1933, 1945, 1990, p 353

different zones of occupation: Aachen was in the British zone and Heidelberg in the American. Moreover, the post-war political allegiances of the states of North Rhine Westphalia (Aachen) and Baden-Württemberg (Heidelberg), while not constant (at least in the case of North Rhine Westphalia), in general deviated significantly from each other.[96] While the same could not be said of the two East German cases chosen, at least during the period 1945 – 1990, the two have differed significantly in their voting patterns since, which may or may not be an indicator of longer term, suppressed differences in political climate between Berlin and Saxony.[97]

The initial aim, then, was to examine how the higher education policy decisions taken at national and state level played out in the individual institutions and to try to extrapolate from this a picture of the development of higher education as a whole in both countries. As my research proceeded, however, it rapidly became obvious firstly, that the focus was too narrow and secondly, that the natures of all the institutions of higher education in both countries were extremely diverse. Hence, by limiting the scope of the thesis to four institutions, the picture obtained would not be indicative of the state of higher education nationally in either. This was particularly true of West Germany, where the level of institutional and state autonomy was, and remains, such that federal bodies had, at best, very limited influence on the decisions concerning policy change. While, in contrast, all policy decisions regarding higher education in East Germany were taken centrally (at least after the Second Reform Act of 1951 – 52 which swept away the education ministries at *Länder* level), conclusive evidence nevertheless emerged from the primary sources of considerable variation in the levels of conformity and resistance among the institutions of higher education, with those further from the centre in Berlin often being less likely to toe the party line. Hence, for example, although they were not alone in this, the activities of the Universities of Rostock and Greifswald to the north and Halle and Jena to the south frequently appeared to be the cause of much impassioned indignation in, and censure from the Committee of Further and Higher Education and the Institute of Marxism-Leninism in Berlin.[98]

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[96] http://www.nrw.de/nordrhein-westfalen/geschichte/; http://www.stm.baden-wuerttemberg.de/de/Geschichte/106717.html (accessed 12.2.2006)

[97] http://www.berlin-brandenburg.de/politik-verwaltung/; http://www.sachsen.de/regierung.html (accessed 12.2.2006)

[98] See for example 'Letter from SED in Rostock to Prof. Hager, Sekretär des Zentralkomittees der SED' which includes an 'Informationsbericht über die Erfüllung des Sonderprogrammes der Universitäten des Bezirkes Rostock 12.11.1969', 'Information über auftretende Probleme, die sich aus der Übernahme des Forschungsneubaus VEB Carl-Zeiss-Jena durch die Friedrich-Schiller Uni Jena ergeben', in SAPMO DY 30/IV A 2/9.04/509; 'Probleme der Profilierung an der Mathematische/Naturwissenschaftliche Fakultät Greifswald 1.2.1968', 'Analyse über die politische-ideologische Situation an der Ernst-Moritz-Arndt

I therefore decided that a more accurate picture could be achieved by taking a wider overview of the development of higher education in both countries. While this inevitably involved sacrificing some degree of detail at the level of the individual institutions, this was compensated for, to a large extent, by the more finely nuanced picture achieved by analysing the country as a whole. One method used to achieve this was a strong focus on the policy-making bodies which, in West Germany, represented government at both *Land* and federal level as well as the individual institutions of higher education. It became obvious that it was the factors influencing the interaction, or lack of it, between these various institutions and organisations which were dictating the pace and direction of the development of higher education in the West rather than any overarching societal or economic imperative. Conversely, while economic and ideological imperatives did form the basis for decisions on higher education policy in the GDR, their frequently-changing nature coupled with differing levels of cooperation or resistance from academia and students in individual universities and *Hochschulen* resulted in a somewhat varied picture across the country as a whole.

Hence, in addition to considering a wide range of secondary literature, my thesis is based on the detailed analysis of a considerable number of archival sources. These include, for West Germany, the files of the federal government-instituted *Wissenschaftsrat* (Science Council) responsible for overseeing all matters relating to higher education; the advisory *Bund-Länder Kommission für Bildungsplanung und Forschungsförderung* (Federal/Land Commission for Education and Research Planning); the *Ständige Konferenz der Kultusminister der Länder* (Permanent Committee of the Culture Ministers of the Federal States who had responsibility for all education in the *Länder*), the advisory *Deutscher Ausschuss für Erziehung und Bildungswesen* (Committee for Education and Culture), the advisory *Bildungsrat* (Education Council) and the *Westdeutsche Rektorenkonferenz* (Permanent Committee of West German Rectors), the latter specifically representing the individual institutions of higher education. Because of data protection strictures, most of the primary information for West Germany in the period 1975 – 1990 came from policy documents in the on-line archive of the *Bundestag*. Some additional primary material was

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Universität (Greifswald) und über das Denken der Wissenschaftler und Studenten in Durchführung der 3. Hochschulreform 30.9.1968', 'Letter from Abteilungsleiter Hörnig to Hager: 'Weiteres Material über die Martin-Luther Universität Halle' 11.6.1968', in SAPMO DY 30/IV A 2/9.04/35

sourced from early issues of *Higher Education in Europe*, the official publication of the Centre Européen pour l'Enseignement Supérieur (CEPES) of UNESCO which reprinted many government policy documents, parliamentary proceedings and speeches on higher education, and a number of OECD reports. Statistical information was sourced largely from these, the publication *Wirtschaft und Statistik* of the Federal Office of Statistics and selected issues of the *Economic Survey of Europe* of the United Nations Economic Commission for Europe.

East German primary sources included the files of the *Kulturbund* (Cultural Association), the *Institut für Marxismus-Leninismus beim Zentralkommittee der SED* (Institute of Marxism-Leninism) and the *Zentralverwaltung der Gewerkschaft Wissenschaft* (Central Administration of the Scholarly Trade Union), which included a full archive of the files of the *Minister für Hoch- und Fachschulwesen* (Minister for Further and Higher Education). Further information was obtained from CEPES, the *Economic Survey of Europe*, OECD reports and from the published *Protokolle der Parteitagen der Sozialistischen Einheitspartei Deutschlands* (minutes of the SED party conferences) as well as from the archives of the Party newspaper, *Neues Deutschland*. Most of the statistical data came from the statistical yearbooks of the GDR.

This strong focus on policy-making bodies combined with an analysis of the effects of policies on several higher education institutions, enable much clearer insights into the reasons for the policy decisions, the effectiveness of their application within the institutions and their ultimate success or failure in terms of the aspirations of the governments of the day.

Chapter outline

The thesis is divided into two parts covering the periods ca. 1945 to ca. 1970, and ca. 1970 – 1990 for the reasons outlined earlier. Part one consists of chapters two through four. Chapter two outlines the background to, and early context of, the development of higher education in Germany before WWII. It traces the development of the academic tradition and the reasons for Germany's international reputation for academic excellence, particularly in the sciences, as well as exploring how this influenced the behaviour of academia through the industrialisation of Germany, the First World War, the Weimar era and during the rise of National Socialism. The catastrophic effects of this, and of the

policies of the National Socialists with regard to higher education for the condition of German academic and scientific achievement are analysed, as are the continuities and discontinuities within the system.

This theme is continued in chapter three with a description of the immediate post-war environment for higher education in what became West Germany. It then examines the growing pressure for reform which accompanied growing democratisation, the widening gaps in technology between Germany and the USA during the 1950s and 1960s and the push for economic growth, which resulted in a major expansion of the higher education system. The implications of this for the funding and autonomy of higher education are discussed, as are the pressures on the institutional structures of academia and the effects on the standards of teaching and research, as well as the initial attempts to direct higher education down a more market-oriented path. An analysis of the consequences for the economic aims of the government runs throughout the chapter.

East Germany in the period until the regime change in 1971 is the subject of chapter four, with a discussion of the three major reforms of the higher education system which systematically sovietised and economised the higher education system as it came under centralised control. The implications of a comparatively large expansion of the system with concomitant curricular changes reflecting the new *Weltanschauung* are discussed with reference to the quality of academic output and funding issues, while the wholesale orientation of higher-level education to economic priorities is analysed as to its feasibility and effectiveness.

Part two of the thesis covers the period ca. 1970 – 1990. The story of West Germany during the 1970s and 1980s is outlined in chapter five. In part as a result of the restrictions on the use of archival material from the mid 1970s onwards, the chapter is divided into two. The first part discusses higher education policy and the changes which took place in the 1970s, including the effects of an even more dramatic rise in higher education participation. It analyses the consequences of the number and type of graduates produced with regard to the economic and technological goals of the country in a period of prolonged economic turbulence. The chapter then explores the consequences of the strategies pursued in the 1970s through the policy changes of the 1980s as endeavours to direct higher education and its research effort to the service of the economy intensified in an attempt to counter the effects of persistently high unemployment levels and stagnating

economic growth. The chapter includes a detailed analysis of the employment market for graduates.

East Germany over roughly the same period is the focus of chapter six with a discussion of the radical cutbacks to higher education introduced by the new leader in 1971 as the ethos changed from the pursuit of technological progress at international level to the increased provision of consumer goods. It then considers the volte-face which took place towards the end of the 1970s as the focus again changed, this time to the high technology sector, and explores the measures undertaken as pressure mounted increasingly strongly on higher education, industry and research institutions to produce enhanced results for much reduced investment as the economy continued to slide downward.

The final chapter returns to the themes developed in the introduction and pulls together the strands of the analyses of the earlier chapters to try and reach some tentative conclusions regarding the question at the heart of the thesis: the effects of policy changes on the contribution of higher education to the economic growth of the two Germanys. It then re-examines the importance of the work to the historiography of higher education, attempts to place this project in historical perspective and highlights areas for future study.

Part One: 1945 – ca. 1970

Chapter 2

Higher education in the German states 1800 – 1949

The higher education system in the federalised German states can be seen as evolving in response to a series of cataclysmic social, political and economic upheavals throughout the 19th and 20th centuries including industrialisation, parliamentary democratisation in the Weimar Republic following the First World War, hyperinflation, the rise of National Socialism (which also saw a brief centralisation of the federal states), and defeat in the Second World War. It has also been characterised by the resistance of academia to change and modernisation, which can be seen either as a response to the crises of orientation created by these upheavals, or as simple intransigence in the face of repeated threats to its status and influence. Following Prussia's rout and near-bankruptcy in the Napoleonic Wars at the beginning of the 19th century and the appointment of Wilhelm von Humboldt as Education Minister, the Romantic philosophical movement in German higher education was replaced by a new humanistic ethos emphasising *Lern- und Lehrfreiheit* (the freedom of learning and teaching) and focused on the fostering of *Bildung* (cultivation of the individual) and *Wissenschaft* (scholarship), decoupled from any direct economic or societal application. The system was responsible for the creation of Germany's international reputation for academic excellence, particularly in the sciences, and became the inspiration for most universities in Western Europe and the USA. However, it also permitted the rise in power of a self-styled and self-replicating academic elite which was to become increasingly isolated from a rapidly industrialising and ever more technologically challenging society.

This 'Ivory Tower' mentality became harder to maintain, however, in the face of the increasing number and social diversity of students entering university as economic prosperity and increasing industrialisation created new and different societal elites demanding a traditional higher education for their offspring. The increasing social egalitarianism which followed the First World War spawned an even deeper disenchantment with what academia regarded as a crisis of modernisation, while the advent of democratic government eroded its elite social status and encouraged a considerable number to support the rise of National Socialism either tacitly or actively. Growing reluctance to participate in international scientific circles, combined with the attitude of the National Socialists towards higher education and research led to Germany falling

increasingly behind international standards in many scientific fields, while large gaps in technology were opening up between Germany and the USA in particular. The outbreak of the Second World War only exacerbated the situation, leaving the higher education systems of both Germanic states with a great deal of leeway to make up by the end of hostilities.

In taking an overview of the period 1800 to 1949, this chapter will trace the development of the German academic tradition and the response of academia to the series of crises outlined above. In so doing, it will establish the basis from which the systems of higher education evolved in both East and West Germany, explain why both states entered the post-war era so far behind the rest of the industrialised world and thus clarify the reasons for the reforms instigated by the respective governments in the second half of the 20th century, which will be discussed in subsequent chapters.

The Humboldtian University

Throughout the twentieth century, convention has identified the German university system as being patterned on the ideals of the 'Humboldtian' university. This humanistic university model, stemming from the work of idealistic scholars such as Wilhelm von Humboldt, Johann Fichte and Friedrich Schleiermacher around the beginning of the 19th century, was part of a series of wide-ranging liberal social and political reforms which took place in Prussia following its comprehensive defeat at the hands of Napoleon I at the Battle of Jena in 1806 and subsequent near-bankruptcy.[1] Prior to this, the core faculties of any European university were considered to be law, medicine and theology. The elevation of the status of science as a professional career option did not take place until after 1825, while the philosophical movement, which in much of Western Europe concerned itself with public debate on social reform and the empirical problems of political change and scientific enquiry, had little relevance to a Germany ruled, as it continued to be, by an autocracy. Instead, romanticism and idealism became the dominant philosophical trends with the emphasis on the aesthetic self-expression of the individual but also of the nation, demonstrated by its allegedly unique culture and the development of distinctive Germanic theories of metaphysical knowledge.[2]

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[1] Kees Gispen, *New Profession, Old Order: Engineers and German Society*, 1815 – 1914, (Cambridge, Cambridge University Press, 1989), p 21

[2] Joseph Ben David, *The Scientist's Role in Society: a Comparative Study*, (Englewood Cliffs, Prentice-Hall Inc., 1971), pp 108 - 111

Much of the older historiography argues that the Humboldtian philosophy was made manifest in the new Berlin University founded in 1810 which then became the prototype for all other modern German universities. Pivotal to the Humboldtian university concept was the belief that, while all academic disciplines should be represented within the university, the core faculty linking all disciplines and faculties should be that of philosophy. In this way the assimilation of science would also ensure a moral education because the unity of research and learning created through total engagement with objective cultural values would develop in the individual student a "force which shaped mentality" and generate the "dynamics which formed reality". This, in turn, would forge an indelible quality defined as *Bildung*, regarded as rivalling the characteristics of the aristocrat. This was to be enhanced through the university's function as a research institution, which through the practice of *Lern- und Lehrfreiheit* would further the cause of "pure" scientific knowledge unaffected by vested interests or external influence. Over time the humanities also came to be treated as sciences with philological investigation being regarded as a valid method of empirical scientific research.[3]

Above all, practicality and utilitarianism in study were to be abhorred as demonstrating a vulgar preoccupation with material gain, or the "petty practicality of the French",[4] (the reform movement in France had abolished all universities in 1793 and replaced them with a number of specialist professional schools where the emphasis was on applied science and specialised education providing technical qualifications for various professions required by the state).[5] In contrast, the German contention was that research without specific goals in mind could provide solutions for unanticipated requirements which scholarship with functional applications at its core would neglect.[6] The only exception to the rule was the introduction of applied chemistry around 1840 in the laboratory of Justus Liebig at the University of Giessen. His encouragement of research into soil and animal chemistry had such obvious direct relevance to an economy suffering from recurrent poor harvests due to what he could prove was soil nutrient depletion, that by the 1850s applied chemistry was

[3] Sylvia Paletschek, 'The German University Idea', in Margit Szöllösi-Janze (ed.), *Science in the Third Reich*, (Oxford, Berg, 2001), pp 37 – 38; Fritz K. Ringer, *The Decline of the German Mandarins: The German Academic Community, 1890 – 1933*, (Hanover New England, Wesleyan University Press, 1969), p 87; Ben David, *The Scientist's Role in Society*, p 112
[4] Ringer, *The Decline of the German Mandarins*, pp 29 - 30
[5] Joseph Ben David, *Centers of Learning: Britain, France, Germany, United States*, (New York, McGraw-Hill, 1977), pp 14 - 16
[6] Paletschek, 'The German University Idea', p 43

integrated as a field of study in universities as well as in technical colleges in a number of states.[7]

Recent research, however, has suggested that the idea of the Humboldtian university is more myth than reality on several counts. For example, in references to the German university system in dictionaries, books or speeches during the nineteenth century the name of Humboldt was rarely, if ever, actually mentioned, nor indeed the idea of a humanistic university. The emergence of the modern university appeared to owe more to the creation of the new *Reformuniversitäten* of Halle and Göttingen during the Enlightenment with their emphasis on rationalism and organisational restructuring. Rather, the universities of 19th century Germany appear to have been run primarily for the social reproduction of a limited number of professions (academia, theology, medicine, the law and the upper levels of public administration) with the development of the humanities and sciences as a secondary remit and only thirdly the function of general education. While *Lern- und Lehrfreiheit* were indeed regarded as sacrosanct, as well as being the special feature and source of the excellence of the universities, this would not appear to have been rooted in the philosophy of idealism but was, rather, a historical legacy from the university's earlier corporate independence.[8]

The autonomy of academia and the social status of professorial staff in the highest echelons of the civil service were safeguarded by the institution of the Academic Corporation, a national body representing the university senates. Although the financial control of the universities remained a matter of state along with the ultimate (if rarely exercised) authority for the appointment of professors to university 'chairs', the university senates were in control of all academic affairs. Notionally, this was supposed to ensure that academic matters would be regulated by experts motivated solely by scholarly interests and the advancement of theoretical knowledge. In practice, as Ringer has argued, it allowed an otherwise politically powerless, intellectual middleclass to form itself into a distinctive elite, an "aristocracy of intelligence", on the basis of its *Bildung*, its close connection with the bureaucracies running the country, the power it exercised though privilege distribution and its role as "guardians of pure learning".[9] As Prussian Minister of Culture Carl Heinrich Becker would later write, "When we speak about the

[7] Alan Beyerchen, 'On the Stimulation of Excellence in Wilhelmian Science', in Jack R Dukes and Joachim Remak (eds), *Another Germany: a Reconsideration of the Imperial Era*, (Boulder and London, Westview Press, 1988), pp 143 - 144
[8] Paletschek, 'The German University Idea', pp 37 - 38
[9] Ringer, *The Decline of the German Mandarins*, pp 34 - 35

university…we have a clear and distinct image in our souls, a sort of Holy Grail of pure scholarship. Its knights serve a sacred cause." [10]

Less than one percent of working males were actually employed in the academic professions during the ninetheenth century, yet these men succeeded in forming themselves into a social and cultural elite which became "the functional ruling class of the nation". Ringer also accused the Academic Corporation of causing the virtual sclerosis of the universities and of "routinising" the idea of self-cultivation into the defence of social privilege and resistance to change, particularly that being wrought by the advent of the industrial revolution.[11] In a sense, the development of the universities simply reflected a feudal ruling system which had prevented the growth of a strongly entrepreneurial or politically important middle class, such as had developed in Britain, and thus discouraged any impetus to apply scientific models to the political economy for economic benefit.[12] However, the neglect of occupational and industrial education with a pragmatic economic orientation and its rigid segregation from personal cultivation also resulted in the social relegation of a large number of the middle classes who had not 'benefited' from a classical education.[13] Despite a modernist minority in academia which recognised the inevitability of industrialisation and a more democratic arrangement of society, the "less articulate, politically unsophisticated and intellectually less distinguished" majority persisted in the preservation of the "mandarin heritage" in society and scholarship in the face of all challenges posed by the changing times.[14]

It is, however, undeniable that German universities were held in high esteem right throughout the nineteenth century. Their traditions of *Wissenschaft* and *Bildung* were deemed responsible for an "impetus to excellence" which had resulted in German research being at the forefront of discovery in numerous fields, while the vast number of professional and academic publications produced had caused German to become one of the global languages of science.[15] As an example, in 1887 seventy percent of all references in psychology texts used German sources as opposed to 21.1 percent for English and only 7.4 percent for French.[16] This begs the question of how what appeared to be a sclerotic, reactionary and elitist bureaucracy managed to produce such internationally esteemed

[10] Carl Heinrich Becker quoted in Paletschek, 'The German University Idea', p 42 (Paletschek's translation)
[11] Ringer, *The Decline of the German Mandarins*, p 35
[12] Ben David, *The Scientist's Role in Society*, pp 109 - 110
[13] Kees Gispen, *New Profession, Old Order*, p 23
[14] Ringer, *The Decline of the German Mandarins*, pp 26; 34 – 35; 38; 130
[15] Beyerchen, 'On the Stimulation of Excellence in Wilhelmian Science', p 139
[16] Ben David, *The Scientist's Role in Society*, p 191

innovative science. One reason was undoubtedly the degree of academic rivalry between the numerous universities in what was a large and rapidly expanding academic market both internationally, and in the German-speaking areas of Europe in particular. Strong competition between universities to attract successful researchers almost certainly counteracted some of the more unwilling universities' reluctance to adopt innovations and obliged them to establish and maintain high standards. Moreover, the major German university laboratories played host to many of the brightest students from all over the world, including virtually all of the most prominent natural scientists working at the end of the nineteenth and beginning of the twentieth centuries. The personal and professional networks thus developed were also effective in overcoming some of the disadvantages created through the isolation of the university laboratories and facilitating coordinated research in particular areas.[17] Competition between the individual federalised states has also been posited as a reason for the level of scientific innovation which earned German higher education global respect.[18] Nor is it likely that every professor was bureaucratically hidebound. Ironically, however, it is equally possible that because those whose primary focus was teaching and research immersed themselves exclusively in this, it left the less imaginative, the "faculty drones", in control of administrative decision-making. This, in turn, probably served to exacerbate the inflexibility already inherent in the system due to their inability to recognise the benefits of change and innovation.[19] More significantly perhaps, a second argument suggests that German science's place at the vanguard of science and technology owed considerably more to the rise in importance of non-academic research facilities from 1840 onwards. These included the establishment of research institutes, the development of industrial laboratories and the *Technische Hochschulen* (polytechnic college equivalents), where the emphasis was on applied research and technological development with a more directly beneficial economic impact.

Industrialisation and the growth of the Technische Hochschulen

As early as 1816 Gottlob Kunth, tutor to Wilhelm von Humboldt, described Germany's relatively unsophisticated level of technology as due to a lack of proper knowledge and educational facilities which were:

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[17] Ben David, *The Scientist's Role in Society*, pp 123 – 125

[18] Uwe Schimank and Frank Meier, 'Forschung an den Hochschulen', Förderinitiative des BMBF: Science Policy Studies, Expertise zum Thema: Neue Steuerungssysteme an den Hochschulen, 31.5.02, p 30, http://www.sciencepolicystudies.de/dok/expertise-schimank.pdf (accessed 4.12.2005)

[19] J Patrick Raines and Charles G Leathers, *The Economic Institutions of Higher Education: Economic Theories of University Behaviour*, (Cheltenham, Edward Elgar Publishing Ltd., 2003), p 178

> …a great handicap for our economic classes…At the same time it consolidates the dividing wall between them and the so-called learned or educated classes – to the detriment of both [20]

Even as late as 1882 at least 43 percent of the working population were still actively involved in the primary sector.[21] Rapid industrialisation, however, created a growing requirement for more educated and specialised personnel, such as engineers, who could adapt to the needs of industrial production. The planning and running of the new factories, for example, required electrical, chemical and metallurgical engineers as well as the more obvious mechanical and construction variety. Electrotechnical development, in particular, required complicated and integrated programmes of research and development involving a number of scientific disciplines. In response, the *Technische Hochschulen* increased in size, multiplied in number and gradually improved their educational prestige. Their research projects resulted, amongst other things, in the rapid development of the electric motor and consequent promotion of power consumption in industry and the home. It had a profound effect on the mechanical construction industry, revolutionising craft traditions such as the optics industry and precision mechanics and was also instrumental in improving productivity and reducing transport and labour costs through the mechanisation of heavy mechanical construction, iron and steel works and the mining industry. Research projects spawned a new electrochemical – electrometallurgical industry which used electrolysis to produce chlorine, carbons, explosives, fertilisers and detergents as well as aluminium, ferroalloys and special steels.[22] Moreover, the *Technische Hochschulen* often incorporated region- and industry-specific specialties. Thus, students in Karlsruhe could major in subjects such as forest-hydraulic engineering as well as construction, mechanical, electrical, chemical, electro-chemical, physical-chemical engineering, architecture and pharmacy. Such was the success of the *Technische Hochschulen* that, as well as contributing significantly to Germany's economic growth, by the beginning of the twentieth century German engineering, technology and engineers were in demand throughout the world, while the strong links between the *Technische Hochschulen* and industry created a steady stream of foreign students eager to study with German industrial chemists and physicists.[23] So unbridgeable remained the rift between *Technik* and *Bildung*, however, that the technically educated were forced to compete with, rather than join the

[20] Gottlob Kunth, quoted in Gispen, *New Profession, Old Order,* p19
[21] Ringer, *The Decline of the German Mandarins*, p 89
[22] Robert Locke, *The End of the Practical Man: Entrepreneurship and Higher Education in Germany, France and Great Britain, 1880 – 1940*, (Greenwich Connecticut, JAI Press Inc., 1984) pp 61 - 68
[23] Locke, *The End of the Practical Man*, p 74

established social order. Gispen argues that the result of this competition was twofold. Firstly, it was responsible for the development of an internationally recognised standard of technological excellence and for the high level of economic achievement which went with it. Secondly, it left traditional academia feeling embattled, strengthening its resistance to change and embedding it even more firmly into the academic culture.[24]

The vast majority of innovations in the chemical field (measured by the number of 'high-value' patents issued i.e. those renewed for fifteen years or more) had been invented and developed not by universities or *Technische Hochschulen,* but by the research and development departments of industrial firms. Additionally, the knowledge transfer which resulted, for example from chemical firms to textile manufacturers, was directly responsible for creating a vigorous cycle of endogenous growth.[25] In an attempt to ensure that the basic research relevant to their needs was carried out, however, many of the major chemical firms created in the 1860s and 1870s had provided financial and material support to some university laboratories, while the German Chemical Society was created in 1867 to assist the bilateral communication of information between industry and academia. Nevertheless, because of the unwillingness of the universities to cooperate in the provision of directed basic research, this too gradually became part of the remit of the *Technische Hochschulen* as well as other extra-academic laboratories such as the *Physikalisch-Technische Reichsanstalt* (Imperial Institute of Physics and Technology) inaugurated in 1887 and the *Kaiser-Wilhelm-Gesellschaft zur Förderung der Wissenschaften* (Kaiser Wilhelm Society for the Promotion of the Sciences) in 1910. This latter was a government sanctioned research foundation for the pursuit of basic research, financed by industry and directed by the universities. It was founded partly in response to the spiralling costs of maintaining scientific laboratories with first-class scientists in individual firms and in direct response to the threat posed to Germany's international leadership in the natural sciences by American advances in the biomedical sciences.[26] The research undertaken was to have both pure and applied dimensions and committed the universities to close, if reluctant, cooperation with both industry and the state.[27] Much care, however, still went into the preservation of institutional vested interests and existing hierarchies of prestige

[24] Gispen, *New Profession, Old Order,* p 34
[25] Jochen Streb, Jörg Baten and Shuxi Yin, 'Knowledge Spillover in the German Empire', in *The Economic History Review,* Vol. LIX, No. 2, May 2006, p 361
[26] Paul Forman, 'Scientific Internationalism and the Weimar Physicists: The Ideology and Its Manipulation in Germany after World War I', in *Isis,* Vol.64, No.2, 1973, p 161
[27] Beyerchen, 'On the Stimulation of Excellence in Wilhelmian Science', pp 155 – 157

within the research field.[28] The university professoriate still appeared happier to countenance the appearance of the new, non-university research establishments than consider making any changes to it own institutional infrastructure and taking full and more directed advantage of the scientific talent at its disposal.[29] Nevertheless, the competition stimulated by the presence of these societies at the cutting edge of scientific research was also responsible for forcing a degree of flexibility on some of the universities at least, resulting in the development of 'pockets of excellence' and a body of scientists convinced of the increasing need for applied scientific research in a time of rapid technological growth. The universities themselves benefited from applied science and technology in the form of better designed and more modern instruments, access to the scientific data produced by other establishments, the opportunity to place graduates in research laboratories and professional discussion with other researchers. Moreover, the university professors were assiduously courted by extra-academic establishments, not only to gain access to research findings, but in an effort to acquire the brightest university students for their own laboratories.[30]

Official recognition of the right of the *Technische Hochschulen* to confer undergraduate and postgraduate degrees, ushering in a new professional structure for German engineers, eventually arrived in 1899. It was fiercely contested by the Corporation of German Universities which deprecated the lack of *Kultur* (culture) in those graduates who had been admitted to the *Technische Hochschulen* with a scholastic background in the natural sciences as opposed to the classics. This was denounced by the German Engineering Association (*Verein Deutscher Ingenieure* or VDI) as a blatant attempt to reinforce social barriers and defend the universities' monopoly of higher education and ultimately, the Corporation's resistance was defeated through the personal intervention of Kaiser Wilhelm II who officially sanctioned the new status of the *Technische Hochschulen.* Ironically, however, Gispen argues that once having obtained full professional status at university level, the teaching bodies of the *Technische Hochschulen* then gradually came to be considered, and to consider themselves, as fully fledged members of the *Bildungsbürgertum* (intellectual middle-classes) and began to define their sector as simply another variant of classical *Bildung*.[31] Moreover, they began to exercise much the same kind of autonomy as did professors of the traditional universities and in many instances

[28] Joseph Ben David, *OECD Fundamental Research and the Universities: Some Comments on International Differences*, (Paris, OECD, 1968) p 31
[29] Ben David, *The Scientist's Role in Society*, p 133
[30] Beyerchen, 'On the Stimulation of Excellence in Wilhelmian Science', pp 143 – 149, 150; see also Locke, *The End of the Practical Man*, p 76
[31] Gispen, *New Profession, Old Order*, pp 114 – 119, 223 - 228

came to display the same resistance to the idea of being seen as the "handmaidens of capitalist industry". This being the case, it is reasonable to surmise that, notwithstanding the huge contribution that the *Technische Hochschulen* had made to scientific and technological progress, their effectiveness in terms of direct responsiveness to societal and economic need was likely to diminish.[32]

Student numbers at the *Technische Hochschulen* continued to increase. The following table illustrates the numbers attending from 1890 – 1910:

Table 2.1

Student Numbers in Technische Hochschulen 1890, 1900, 1910

	Number of Students		
Technische Hochschule	**1890**	**1900**	**1910**
Charlottenburg	1,640	4,343	2,943
Munich	882	2,476	3,062
Darmstadt	318	1,674	1,768
Karlsruhe	571	1,538	1,343
Hannover	580	1,458	1,770
Dresden	403	1,161	1,447
Stuttgart	496	1,034	1,224
Aachen	198	567	916
Brunswick	273	483	663
Danzig	-	-	1,315
Breslau	-	-	117
Total	**5,361**	**14,734**	**16,568**

Source: Robert Locke, *The End of the Practical Man*, (Greenwich Connecticut, JAI Press Inc., 1984), p 34

Particularly striking is the leap in the numbers attending *Technische Hochschulen* in the decade 1890 – 1900 during which the population of the country increased by only ten percent, and before the *Technische Hochschulen* had acquired university level status. This arguably indicated a growing disenchantment with the more hierarchical distribution of privilege in society. More likely, it simply reflected the increasing pace of German industrialisation and perceived opportunity in a changing society. More practically, however, it also caused a serious glut of technically trained personnel on the job market, most particularly in the decade before WWI. This particular crisis saw virtually an entire generation of graduates, which had enrolled expecting to graduate into a profession with

[32] Kees Gispen, Poems in Steel: *National Socialism and the Politics of Inventing from Weimar to Bonn*, (New York, Berghahn Books, 2002), p 4

good career opportunities, being employed in inferior positions for which their training was wholly unsuitable and earning salaries which were often lower than those of skilled blue-collar workers. Moreover, unless possessed of exceptional talent or advantageous social connections, professional advancement became progressively more unlikely. Enrolment was particularly high in the mechanical engineering departments of the *Technische Hochschulen*, considered to be the most versatile, most easily adaptable course and thus most useful for career purposes. Numbers in this discipline rose by more than 300 percent from 1890 – 1891 (1,878 students) to 1901 – 1902 (7,593 students). To some extent, however, this rise may also have been due to the lack of non-academic engineering schools, because what employers actually appeared to want were large numbers of the more practically trained *Techniker* rather than *Diplom-* and *Doktor-Ingenieure* with no workplace experience and few practical hands-on skills. This was intensified by a trend towards the increasing bureaucratisation of industry, and attempts to improve productivity through the increasing division of labour and the fragmentation and deskilling of jobs which accompanied the rise of large industrial firms. Hence, the career prospects for the majority of academically trained engineers were bleak. Although primarily a cyclical problem caused by over-rapid expansion of the sector, the effect was what the *Verband Deutscher Diplom-Ingenieure* (VDDI) described as a harmful and degrading double proletarianisation bringing with it a loss of both income and professional identity accompanied by the fear of downward social mobility.[33]

However, the elite, quasi-aristocratic position of the traditional academics was also becoming increasingly untenable. The accelerating decline in the classical tradition of the university raised fears among the academic elite that the universities were being turned into "factories for practical research and the mass production of technicians" and that the traditional identification between the universities and the cultivated segment of society was being lost.[34] Germany's belated and somewhat abrupt change from backward agricultural nation to industrial superpower had led to the evolution of an industrial elite and new socio-economic power blocs which had a dramatic effect on the political landscape. As well as a consistent rise in the number of *Technische Hochschule* students, university populations were also becoming larger and more socially diverse with the number of students registered doubling between 1876 and 1892 from 16,124 to 32,834.[35] This led to the first coining of the slogan 'academic proletariat' prompted by fears of a surfeit of

[33] Kees Gispen, *Poems in Steel*, p 4
[34] Ringer, *The Decline of the German Mandarins*, pp 51 - 55
[35] Ben David, *The Scientist's Role in Society*, p 129

theoretically educated graduates vying for a very limited number of positions in the 'learned professions' of law, medicine, the church, the upper civil service and secondary and university teaching.[36] By 1918 student numbers would increase even further to 72,000. The relatively much smaller increase in the numbers of academic staff, from 1,313 in 1860 to 3,090 in 1909, in part caused by the operation of the academic promotional process, resulted in a much higher teaching load for academics with correspondingly less time to pursue research interests.[37]

Running parallel to this was a growing trend toward specialisation in research, which did not conform to the accepted traditional divisions in university science. Rather than reforming their organisational structure to encompass the new specialties, however, the academic corporations professed the fear that overspecialisation would cause the neglect of the larger, more basic questions of science. This led them to restrict the development of new disciplines even, for example, in such intellectually important fields as physical and physiological chemistry, and to relegate them instead to the status of sub-specialties within existing disciplines under the control of a single professor who ostensibly was expert in them all.[38] The limiting of the number of professorial chairs in this way obviously reinforced their elite status, but it also further increased the ratio of students to full professors from 17:1 in 1870 to almost double that by 1905. The professors felt themselves increasingly beleaguered.[39] However, there were increasingly numerous complaints that professors in fact spent too much time researching obscure specialities instead of teaching[40] and that the instruction given was overly theoretical meaning that graduates were unable to adapt effectively to employment outwith academia.[41]

Higher Education in the Weimar Republic

The loss of the First World War, the end of the monarchical system and the ensuing political revolution accompanied by economic collapse and catastrophic hyperinflation served to deepen the divisions within higher education and between higher education and

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[36] Fritz K Ringer, referring to the German case in 'Segmentation: the case of French secondary education' in Detlef K. Müller, Fritz Ringer and Brian Simon (eds), *The Rise of the Modern Educational System: Structural change and social reproduction 1870 – 1920*, (Cambridge, Cambridge University Press, 1987), pp 63 and 68
[37] Beyerchen, 'On the Stimulation of Excellence in Wilhelmian Science', p 155
[38] Ben David, *OECD Fundamental Research and the Universities*, p 30
[39] Beyerchen, 'On the Stimulation of Excellence in Wilhelmian Science', p 155
[40] Paletschek, 'The German University Idea', p 40
[41] Ben David, *OECD Fundamental Research and the Universities*, p 34

society. The belief that true scientific objectivity was incompatible with politics allowed academia simultaneously to reject the new democratic regime and to see themselves as the only true representatives of the interests of the nation.[42] The professoriate came to believe that they, the "bearers of culture", were living through a "crisis of culture"[43] which threatened their status as a social and cultural elite and their hold over the major administrative systems of the country. For one thing, their conviction of the superiority of German culture and the German *Sonderweg*[44] had been shown to be very misplaced. Secondly, the hyperinflation of the early 1920s had increased the trend towards egalitarianism by strengthening the new entrepreneurial, managerial and technical elites whilst concentrating its more destructive effects on the traditional middle class. This particularly affected those in the public sector such as higher officials and professors, whose social position demanded an expensive lifestyle but whose incomes lagged well behind the escalating cost of living.[45] Thus, although the financial position of academics was no worse, and indeed, rather better than that of many other groups as the hyperinflationary period ended, it had nevertheless weakened their material position and caused deep concern about the erosion of status differentials in society and the maintenance of their position within it.[46]

Thirdly, in an economy which increasingly demanded technically trained manpower in order to translate technological transformation and booming industrial development into economic growth, those trained academically for traditional careers in the army and civil service found their employment opportunities narrowing and hence the rewards achievable from years of study receding, leaving many feeling "spiritually and physically exploited".[47] Fourthly, the pressure to fill the growing numbers of teaching and engineering positions resulted in the changing and lowering of university entry requirements and created fears of a "democratisation of the professions".[48] The result was disaffection from the new liberal society which the Weimar Convention was attempting to create and a retreat into "a kind

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[42] Paul Forman, 'Scientific Internationalism and the Weimar Physicists', p 152; Jeremy Leaman, *The Political Economy of West Germany 1945 – 85*, (Basingstoke, The Macmillan Press Ltd., 1988), p 15
[43] Ringer, *The Decline of the German Mandarins*, p 3
[44] Interpreted here as the German 'special path' to social reform in an authoritarian state, which avoided the weaknesses inherent in both the autocracy of Eastern European states, particularly Russia, and what were regarded as the decadent and ineffective democratic governments of the West typified by Great Britain and France. For a refutation of the Sonderweg theory see David Blackbourn and Geoff Eley, *The Peculiarities of German History: bourgeois society and politics in nineteenth-century Germany*, (Oxford, Oxford University Press, 1984)
[45] Ringer, *The Decline of the German Mandarins*, pp 62 - 63
[46] Bernd Weisbrod, 'Bourgeois Society in Germany', in Richard Bessel (ed.), *Fascist Italy and Nazi Germany: Comparisons and Contrasts*, (Cambridge, CUP, 1996), p 31
[47] David Schoenbaum, *Hitler's Social Revolution: Class and Status in Nazi Germany 1933 – 39*, (New York, WW Norton and Co. Inc. 1980), pp 9 – 10
[48] Weisbrod, 'Bourgeois Society in Germany', p 32

of Peter Pan ideology for a society that didn't want to grow up".[49] A further factor was the expansion and changing nature of the university population. Most historians highlight the radical change which took place in the student body with, by 1930, almost seventy percent of students coming from the middle and particularly the lower middle classes.[50] Working class representation was still no higher than three percent, but the most significant change was that women constituted around sixteen percent of the student population. Given its previous adamant resistance to female participation, it seems highly ironic that the greatest proportion of these consisted of the daughters of the educated elite.[51] The following table gives the number of students attending university and the *Technische Hochschulen* during summer semester over the period 1913 – 1929:

Table 2.2

Student Numbers in Universities and Technische Hochschulen

(selected years 1913 - 1929)

Year	Universities				Technische Hochschulen			
	Males	**Females**	**% Females**	**Total**	**Males**	**Females**	**% Females**	***Total***
1913	56 693	3 368	5.6	60 061	11 705	62	0.5	11 767
1924	60 654	7 460	11.0	68 114	21 460	357	1.6	21 817
1925	53 650	6 808	11.3	60 458	20 842	374	1.8	21 216
1926	57 170	7 851	12.1	65 021	21 315	368	1.7	21 683
1927	62 569	9 570	13.3	72 139	20 461	466	2.2	20 927
1929	78 167	14 923	16.0	93 090	22 024	657	2.9	22 681

Sources: Statistisches Jahrbuch für das deutsche Reich, 1928, pp 509 – 510; 1930, pp 456 – 457

The table demonstrates three things in particular. Most obvious is the steady increase in student numbers at both university and the *Technische Hochschulen* despite a blip in the year 1925. Secondly, the number of female students in higher education also rose consistently with history, and in particular 'philological historical science' followed by general medicine and mathematics and the natural sciences, by far the most popular choices. In the *Technische Hochschulen* the most favoured option for women was general science followed by architecture and, increasingly over the decade, chemistry, metallurgy and economics. Although 1913 saw the first women studying agricultural engineering,

[49] Schoenbaum, *Hitler's Social Revolution*, p 13; for a discussion on the political economy of this period see also Leaman, *The Political Economy of West Germany 1945 – 85*, pp 12 - 17
[50] Paletschek, 'The German University Idea', p 40
[51] Ringer, *Education and Society in Modern Europe*, p 98

mechanical engineering and electrotechnology, they were never numbered in more than threes and fours throughout the 1920s.[52]

Thirdly, the figures clearly show the supremacy in numbers of university students compared to those in *Technische Hochschulen*. Thus, by virtue of sheer size alone the contribution of the universities remained of crucial potential importance to the national economic effort and to technological growth. If, as has been argued, their structure and organisation was overly rigid, their focus was on the purely theoretical and their product was graduates whose education left them ill-equipped to take their place in the employment market, this would inevitably have had an adverse effect on the country's potential for growth. Moreover, it has been suggested that although Germany still ranked as a world leader scientifically until the early 1920s, most of that reputation for excellence was as a result of work done before WWI; thereafter the crown was being steadily lost to the USA. By the decade 1910 – 1920 the majority of the great German scientists were ageing, while in the US the organisation of scientific research was advancing with such rapidity that in 1930, for example, the US accounted for almost thirty percent of the total production of scientific papers in the chemistry field and over thirty percent in the field of physics as opposed to Germany's six percent in both.[53]

The new republic was keen to effect reforms which would better integrate the institutions of higher education into the changing society; however, few of the reforms proposed were ever realised.[54] Nevertheless, three new urban universities were founded in Frankfurt, Hamburg and Cologne which concentrated on practical research in new fields such as social and commercial science, politics, municipal and social administration as well as in older disciplines such as medicine. The idea of incorporating such innovations into all universities, however, again brought forceful and obdurate opposition from the Corporation of German Universities.[55] More opposition was incurred by the development of an enhanced status for the new and independently funded business schools (*Handelshochschulen*). Developed from existing two-year business school programmes, their mission was to impart an "entrepreneurial way of thinking".[56] Their increasing popularity led to the expansion of the curriculum into "pragmatic disciplines" including business economics (as opposed to the traditional historically-oriented German

[52] *Statistisches Jahrbüch für das deutsche Reich*, pp 509 – 510 (1928) and pp 456 – 457 (1930)
[53] Ben David, *OECD Fundamental Research and the Universities*, pp 23 - 26
[54] Paletschek, 'The German University Idea', p 41
[55] Ringer, *The Decline of the German Mandarins*, pp 69 - 77
[56] Locke, *The End of the Practical Man*, p 209

economics), auditing, financial accounting and the development of modern management techniques.

These institutions ultimately gained the right to grant not only undergraduate degrees, but also doctorates in 1928. In the eyes of established academia, the status of these institutions was seriously compromised because, for the first time, students could enter higher education without first having succeeded in passing the *Abitur* (although the majority of those entering had in fact done so). Moreover, most of the professors who taught there originally were men with undistinguished academic histories (though a great deal of practical experience and personal talent), many of whom had to be awarded honorary doctorates by the state in order to be legally able to teach at 'university' level. The business schools were, nevertheless, popular, well funded and rapidly became an established feature of German higher education performing their own, practically oriented research.[57] One effect appeared to be a much higher level of commercial awareness in German firms. By 1927, the Balfour Committee on Industry and Trade would draw an unfavourable comparison between the tens of students undergoing commercial education in Great Britain compared to the hundreds in Germany at a time when British export performance was suffering at the hands of well trained German export salesmen instructed in their customers' languages and backed up by a commercially minded consular service.[58]

In contrast, post-war inflation and excessive reparation demands ensured that the state-funded universities were suffering from an increasing inability to pay for even the most basic of scholarly provisions, causing fears of permanent damage to German research and scholarship.[59] In appeals for financial support, luminaries such as Max Planck, Adolf Harnack, Fritz Haber and the spokesmen for the Union of German Universities argued that "scientific and scholarly prestige [was] the sole great-power attribute remaining to the German nation…[acting]… as a surrogate for the other, lost attributes of a great power".[60] It was an argument which appeared to have resonance across the political spectrum with even the Social Democrats calling for billions to be struck from the military budget and re-employed in the service of culture and science.[61] Forman has demonstrated, however, that the doctrine of science as a surrogate for military and economic might, when coupled with general academic disaffection, also led to a situation where the German researchers

[57] Locke, *The End of the Practical Man*, pp 199 - 209
[58] Stacey, cited in Locke, *The End of the Practical Man*, pp 203 – 204; Peter Pagnamenta and Richard Overy, *All our Working Lives*, (London, BBC, 1984), p 272
[59] Ringer, *The Decline of the German Mandarins*, pp 62 - 63
[60] Max Planck, quoted in Paul Forman, 'Scientific Internationalism and the Weimar Physicists', p 163
[61] Forman, 'Scientific Internationalism and the Weimar Physicists', p 164

withdrew their cooperation with major international scientific bodies such as the International Research Council because they feared not being given due recognition as one of the leading nations of the world.[62] Again, Forman argues that this conduct received enthusiastic approval right across the political spectrum. However, this academic self-isolation also meant withdrawal from multilateral international scientific competition and almost certainly contributed to the deficits in German science which were to be reinforced during the National Socialist era and would lead to the opening of large gaps in technology between Germany and the West.[63]

The situation was aggravated by the decline of the economy after 1923 which lasted right up until the Great Depression and the ultimate demise of the Weimar Republic. In response, both industrialists and labour advocated the *Rationalisierung* (rationalisation) of industry in order to be able to undercut foreign competitors and earn the necessary foreign currency to pay the war reparations. However, while for labour this meant the adoption of the latest technologies in order to create economic well-being across society in an "American-style consumer society", industrialists interpreted it rather as the introduction of harder work for longer hours in an effort to cut costs. The encouragement of invention and the introduction of new technologies was also de-prioritised in favour of investment in new machinery to better exploit existing technologies. The result, predictably, was a period of technological stagnation. This gave rise to serious antagonism from engineers, inventors and industrial scientists who regarded innovation as the best means of stimulating economic growth and the introduction of American-style efficiency to German industry.[64]

The rise of National Socialism

Alienation from what it saw as a crisis of modernisation caused by the "accelerated speed of the industrial and technological revolution"[65] and a perceived deterioration in the tone of academic life led academia to an even more rigidly nostalgic attachment to the values of the past and calls for a restoration of the true humanistic university concept coupled with a retreat from practically oriented research. More dangerously, their progressively stronger rejection of Western politics and liberal Western thought allowed the professors to identify

[62] Fritz Haber, quoted in Forman, 'Scientific Internationalism and the Weimar Physicists', p 163
[63] Forman, 'Scientific Internationalism and the Weimar Physicists', pp 165 – 167
[64] Gispen, *Poems in Steel*, pp 110 - 111
[65] Eduard Spranger, quoted in Paletschek, 'The German University Idea', p 42

themselves increasingly with the growing *völkisch* (nationalistic-ethnic) movement[66] and the idea of a strong state with a cohesive national community which would re-establish the lost certainties of a bourgeois way of life.[67] Coupled with a strong degree of latent anti-Semitism, their hypothetically neutral stance towards politics, contemporary affairs and even technology, by which they affirmed themselves as elevated from the rest of society, allowed right wing interests to abuse the study of history and literature for anti-Semitic and virulently nationalistic propaganda, thereby assisting the rise of the National Socialists.[68] Majority support for the Nazis had also been achieved in a violently anti-Semitic student body long before 1933.[69] By the time the academic elite realised that the "national" movement claiming to represent a "spiritual revival" which they had regarded as "genuine at the core" if a little "undisciplined" was in fact wholly pernicious, it was far too late to revise their position. Through what has been described as their "abandonment of intellectual responsibility",[70] the consequences for academia as well as for the nation were disastrous.

If the increase in the student population pre-WWI had created fears of an academic proletariat in Germany, at the beginning of the 1930s student population ratios of around 25 per 10,000 of national population appeared to be causing generalised panic at the prospect of the creation of an entire generation of unemployed academics, as expressed in the writing of Pascal Jordan:

> Only a fraction of those studying today will have the opportunity to find a position such as that which they have in mind in the civil service…the reason for this overexpansion is without doubt mainly due to the defective structure of our education system (more exactly: to the failure of the politically motivated reforms which have been carried out since 1918)[71]

University graduates were again forced to take up positions inconsistent with their qualification level working, for example, in business where their qualifications were largely irrelevant.[72] In industry, graduate engineers were increasingly falling foul of the

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[66] Paletschek, 'The German University Idea', p 43
[67] Weisbrod, 'Bourgeois Society in Germany', p 33
[68] Ben David, *The Scientist's Role in Society*, pp 136 – 137
[69] Weisbrod, 'Bourgeois Society in Germany', p 33
[70] Ringer, *The Decline of the German Mandarins*, pp 443 - 446
[71] Pascual Jordan, 'Die Wandlung der Universität', *Rostocker Universitätszeitung* vom 9. Mai 1933 pp 3 – 5, Appendix 1 in Dieter Hoffman,'Pascual Jordan im Dritten Reich – Schlaglichter', Preprint 248, Max-Planck-Institut für Wissenschaftsgeschichte, 2003, p 13, http://www.mpiwg-berlin.mpg.de/Preprints/P248.PDF (accessed 12.2.2006)
[72] Ringer, *Education and Society in Modern Europe*, p 99

social conflict between the tradition of engineers as on-the-job trained craftsmen and the concept of a formally educated applied scientist. As a result, many complained of their "misuse or non-use".[73] Under the National Socialists, therefore, enrolment quotas for higher education were introduced, in particular for women.[74] The following table shows the decline in student numbers from 1929 to 1937:

Table 2.3

Student Numbers in Universities and Technische Hochschulen (selected years 1929 – 1936)

Year	Universities				Technische Hochschulen			
	Male	Female	% Female	Total	Male	Female	% Female	Total
1929[1]	78 167	14 923	16.0	93 090	22 024	657	2.9	22 681
1934/35[2]	57 158	10 990	16.1	68 148	12 628	471	3.6	13 099
1936/37[2]	40 726	7 382	15.3	48 108	10 603	325	3.0	10 928

[1] Summer Semester
[2] Winter Semester
Sources: Statistische Jahrbücher für das deutsche Reich (1930 - 1937)[75]

The reduction in numbers is striking. In a comparison with the 1929 figures, the number of men studying at university almost halved and the number of women was reduced by more than half, although their respective proportions remained little altered; the *Technische Hochschulen* were even worse affected. The situation was aggravated by the introduction of a compulsory six-month spell in labour camp and a further two years in military service for all those males succeeding in university entrance examinations. Once there, they were subjected to many pressures to remain in military service instead of taking up their university places.[76] Formal university entry requirements were relaxed to favour deserving young Nazis who had proved their credentials through enlistment in the Hitler Youth or the Labour Service; nevertheless, these ultimately accounted for less than one percent of admissions to university and 1.76 percent to *Technische Hochschulen*. Thus,

[73] Locke, *The End of the Practical Man*, pp 79 - 80
[74] Ringer, *The Decline of the German Mandarins*, pp 439 – 440
[75] *Statistisches Jahrbüch für das deutsche Reich*, (Berlin, Verlag von Reimar Hobbing, 1930), pp 456 – 457 and (Berlin, Verlag für Sozialpolitik, Wirtschaft und Statistik GmbH., 1935 and 1937), pp 520 – 522 (1935) and pp 582 – 583 (1937)
[76] Arthur Hearnden, *Education in the Two Germanies*, (Oxford, Basil Blackwell, 1974), p 28

any change in the social origins of the student body was infinitesimal and the recruitment patterns established throughout the 19th century persisted.[77]

The system of academic self-government, however, was destroyed. Freedom of learning and the principle of the objectivity of scholarship were officially repudiated and there was an upsurge in research and teaching based on racism and *völkisch* thinking. The new regime had no use for scholarship without practical application for the aims of National Socialism and thus some of the more theoretical academic subjects were withdrawn to be replaced with pseudo-sciences such as Aryan linguistics, eugenics and the bizarre *Welteislehre* – a National Socialist invention starting from the somewhat dubious premise that the cosmos was formed by the energy derived from the struggle of blazing giant suns with infinite ice-fields in the universe.[78] Technological development was heavily prioritised and the Kaiser- Wilhelm Institutes met with particular favour. Their research, centred on the practical application of science in industry, had been involved throughout the Weimar period in projects aimed at economic self-sufficiency in order to free Germany from dependency on world markets. This pursuit of autarchy was unquestionably of benefit to the National Socialist in the build-up to war, thus the percentage of the national research funding 'pot' allocated to the KWG increased exponentially till 1945 at the expense of the *Hochschulen*.[79]

Reich Minister for Propaganda, Joseph Goebbels stated that, "We...live…in a century whose melody is determined by the thousand-fold buzz of machines and roar of engines".[80] Hence, large quantities of money were poured into applied and military research and development, particularly in strategic areas such as high-altitude flight, jet engines, high-speed aerodynamics, ballistics and rocket research. Despite this, however, and the growth of *Luftfahrtzentren* (Aviation Academic Education Centres) at a number of technical universities, the research effort was continually constricted by a shortage of qualified personnel. For example, in order to proceed at the pace and in the direction specified by the Nazi regime there was an estimated need for around 3,600 aeronautical

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[77] Schoenbaum, *Hitler's Social Revolution*, pp 262 – 263

[78] Margit Szöllösi-Janze, 'National Socialism and the Sciences', in Szöllösi-Janze (ed.), *Science in the Third Reich*, pp 2 - 6

[79] Ute Deichmann and Benno Müller-Hill, 'Biological Research at Universities and Kaiser Wilhelm Institutes in Nazi Germany' in Renneberg Walker (ed.), Science, *Technology and National Socialism*, (Cambridge, Cambridge University Press, 1994), p 169; see also Susanne Helm, Carole Sachse and Mark Walker, *The Kaiser Wilhelm Society under National Socialism*, (Cambridge, Cambridge University Press, 2009); Kristie Macrakis, *Surviving the Swastika: Scientific Research in Nazi Germany*, (Oxford, Oxford University Press, 1997)

[80] 'From Bayreuth to Theresienstadt', *The Economist*, Vol. 379, No. 8472, 8.4.06, p 48

engineers annually: the *Hochschulen* managed to produce only 16 in 1937, 56 in 1938 and 57 in 1939. Additionally, long-term research projects were abandoned in favour of projects of immediate use to the war effort, with the work increasingly tightly supervised by military and state bureaucracy, while secrecy was dramatically intensified. Indeed, obsessive secrecy was a feature of most areas of scientific research under National Socialism and therein lay a significant problem. Internally, an embargo on scientific publications prevented teamwork and blocked continuous cooperation on larger projects, which was particularly harmful to 'big science' projects such as aeronautics and atomic science. [81] Even more seriously, the long-term prospects, even for those scientific areas prioritised by the regime, were compromised by a virtual across the board prohibition of access to the wider scientific community. Germany's disconnection from international scientific development effectively prevented the transfer of knowledge and technology thus further restricting its own scientific and technical progress. [82]

The regime refused to recognise the traditional apolitical stance of the professoriate and proof of political reliability became generally mandatory. Few resisted NS pressure. Some, such as physicist Pascual Jordan, frankly allowed themselves to become political instruments exhorting the scientific community to orient research towards rearmament and an increase in technological capability because of the progressively more technical nature of war:

> the ruling events of the young Greater German Reich – the four-year plan, rearmament and war – have shown work in the natural sciences its fixed place in the life of the nation[83]

More damaging still, after 1933 more than 2,500 scholars and scientists, classed as either non-Aryan, with Jewish spouses or politically unreliable were expelled from universities, Kaiser-Wilhelm Institutes and other research centres. This involved around fifteen percent of all university professors and *Dozenten* (associate professors)[84] but accounted for twenty-five percent of all physicists and twenty-six percent of all biochemists, reflecting

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[81] Helmuth Trischler, 'Aeronautical Research under National Socialism', in Szöllösi-Janze, *Science in the Third Reich*, pp 84 - 96

[82] Szöllösi-Janze, 'National Socialism and the Sciences', p 22

[83] Pascual Jordon, 'Olymiade der Wissenschaft', *Der Student in Mecklenburg-Lübeck* vom 5.12.1936 pp 8 – 9, Appendix 3 in Hoffman, 'Pascual Jordan im Dritten Reich – Schlaglichter', p 20; Pascual Jordan, 'Naturwissenschaft im Umbruch', in *Deutschlands Erneuerung*, Vol. 25 (1941) pp 452 – 458, Appendix 4 in Hoffman, 'Pascual Jordan im Dritten Reich – Schlaglichter', p 22

[84] Mitchell G Ash, 'Scientific Changes in Germany 1933, 1945, 1990: Towards a Comparison', *Minerva* 37, pp 329 – 354, 1999, p 332

the high proportion of Jews in these disciplines. More than two thirds were forced to emigrate and a small number were killed or died in concentration camps. The Jewish scientists had tended to work in more modern and progressive areas which challenged the traditional trajectory of scientific development, in large part because of a high degree of anti-Semitism in academia which prevented their progression in the fields of 'pure science'. Their dismissal was accompanied by the marginalisation of many of their innovations, either in an attempt to secure the approval of the National Socialists or to avoid any possible association with Judaism.[85] The overall loss to German scholarship and science caused by the forced emigrations was immense and was, moreover, a direct cause of the strikingly backward state, particularly of biotechnology in Germany through the 1970s. By the time the significance of biotechnology to future technological development was belatedly realised, the gaps in the infrastructure of research and development would be virtually insurmountable. Additionally, those scientists expelled numbered among the most gifted and most often cited scientists in the world (more than 2.4 times more often than those who remained) and included a large number of future Nobel Prize winners.[86] The forced expulsion also enabled the transfer of specific research programmes, for instance in nuclear physics and molecular biology, to the countries receiving the émigrés, thus benefiting their research at the expense of Germany's. The refinement of these projects would ultimately result in developments such as particle accelerators and the world's first ultraviolet spectrophotometer.[87]

The Aftermath of World War II

After 1945, the country suffered another political, economic, social and cultural upheaval akin to that experienced in 1919. The effects of almost half a century of war, preparation for war and huge constitutional upheaval had been accompanied by a more global change in the *Zeitgeist* which challenged the traditional distribution of status in society. In German academic circles, however, the animosity of the National Socialists towards them had simply reinforced the professors' perceptions of themselves as an elite. Most maintained that they had preserved the purity of scientific knowledge undefiled by ideological distortion. Their invocation of the value-neutrality of science reflected their

[85] Szöllösi-Janze, 'National Socialism and the Sciences', p 25
[86] Ute Deichmann, 'The Expulsion of German-Jewish chemists and Biochemists and their Correspondence with Colleagues in Germany after 1945: The Impossibility of Normalisation?', in Szöllosi-Janze (ed.), *Science in the Third Reich*, pp 245 - 246
[87] Ash, 'Scientific Changes in Germany 1933, 1945, 1990', pp 340 - 341

lack of self-criticism and denial of any responsibility for the rise of National Socialism. This was epitomised by the level of indignation expressed during the Allies' attempted denazification of higher education which resulted in some 4,289 scholars and scientists being dismissed as well as the complete closure of some institutions. Otto Hahn, for example, stated, "I consider it an injustice."[88] Others, such as Pascual Jordan whose cooperation with the National Socialists was indisputable, attempted to justify their actions:

> I thought the radicalism shown at the beginning would evade [sic] with time and a tolerable situation would return by steps…I hoped to be able to accelerate this evolution to a certain little extent…[opposition] would have meant for me…certainly ruin of my existence…I had to become a member of the party[89]

The denazification process will be discussed in more detail in subsequent chapters. More bleakly for Germany as a whole, some 2,925 of the most talented chemists, physicists, aeronautics experts and rocket scientists were taken from the Allied zones and removed mainly to America or Russia as a sort of 'intellectual reparation'. Moreover, though many who went to the Soviet Union later returned to the GDR, those who went to the USA tended to stay there because of the lack of career opportunities in Germany in their fields, though this may have been balanced to a slight extent by the return of an unknown (but considerably smaller) number of those scientists expelled by the Nazis.[90]

Transcending the huge political discontinuities caused by the war and the division of the country, firstly into the Allied Zones of Occupation and later into East and West Germany, there was considerable continuity in terms of research and development. In the Western zones the old Kaiser-Wilhelm Society was re-invented as the Max Planck Society, while the former Prussian Academy of Sciences was restructured to form the *Akademie der Wissenschaften* (Academy of the Sciences) in the East. Name changes aside, they seem to have maintained a very similar programme of research to that which was being followed before and during the war, albeit somewhat hampered by lack of capital, equipment and the loss of data. Although this continuity might have been expected to be beneficial to the research effort, it served, in fact, to prevent the adoption of innovative developments from

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[88] Otto Hahn in a letter to Otto Meyerhof in June 1946, in Deichmann, 'German-Jewish Chemists and Biochemists in Exile', p 257 (Deichmann's translation). Nobel laureate Hahn became the founding president of the Max Planck Society for the Advancement of Science in 1948, remaining there until 1960

[89] Pascual Jordan, in a letter (in English) to Niels Bohr, Copenhagen, May 1945, Appendix 5 in Dieter Hoffman, 'Pascual Jordan im Dritten Reich – Schlaglichter', pp 29 – 30

[90] Ash, 'Scientific Changes in Germany 1933, 1945, 1990', pp 334 - 341

within and without the Germanys for a considerable number of years, arguably another primary reason for the backwardness and lack of international relevance of the science of both East and West.[91] As the French government stated to the governor of Mainz in 1949, "The backwardness of German scholars is in effect such that one can scarcely say …if their work could be of any use to us".[92] To this must obviously be added the difficulties caused by the very precarious, impecunious and unstable working conditions which prevailed in the immediate post-war years, as well as the climate of mistrust in the international scientific community towards those scientists who had prospered under National Socialism which hampered Germany's reintegration into international organisations.[93]

A different sort of continuity was evident in the universities post 1945. A rejection of National Socialism and everything it stood for led to a purported reversion to the 'cultural tradition' of the *überzeitlich* (timeless) ideal of the neo-humanistic university, even if its interpretation differed considerably in each of the new German states. In the West, the Humboldtian 'tradition' with its emphasis on the classics and humanism was seen as representing a safeguard against the return of the practical scholarship of National Socialism; however, the fact that it also entailed the preservation of the previous organisational structure blocked all attempts at university reform and ossified conditions in the universities for decades.[94] The genuine and universal agreement in the country for the development of a politically democratic German state was not matched by a similar conviction in the majority of professors of the need for democracy within the universities including the *Technische Hochschulen.* As British officials noted:

> The power of routine justified as efficiency, of inertia glorified as loyalty to tradition…is surprising in Germany…both in schools and universities the same dislike of change, the same unwillingness to reassess the whole situation and modify past practice to meet it is very marked.[95]

Eventually, the general public perception of the education system as *im Kern gesund* (sound at core) and the widely expressed wish to retain it influenced the occupying

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[91] Ash, 'Scientific Changes in Germany 1933, 1945, 1990', pp 341 – 343
[92] Burghard Weiss, 'The Minerva Project' in Renneberg and Walker (eds), *Science, Technology and National Socialism*, p 290
[93] Ash, 'Scientific Changes in Germany 1933, 1945, 1990', p 343
[94] Paletschek, 'The German University Idea', p 53
[95] 'Control Commission for Germany (British Element) Report', Sept 1947, reprinted in Hearnden, *Education in the Two Germanies*, p 42

authorities to permit its preservation despite their many efforts at reform.[96] Thus, the newly democratic and capitalist West was supported by one of the most undemocratic and feudal systems of higher education in Europe, one which essentially remained the preserve of the middle classes through the disparity of educational opportunity and provision existing across the states, which effectively ensured that elementary school education constituted the only prospect for the majority and which supported academia's position as a self-replicating societal elite.[97]

The founding of the new Free University of Berlin in 1948 in response to a very specific situation in the divided city was, nevertheless, envisaged as providing a positive influence for change on the universities of the West. This was a much more democratic institution with a more egalitarian population and strong student representation in its governance, including a say in the appointment of professors. The university also incorporated a much more flexible attitude to study, with evening, part-time and distance learning courses (via the radio) being offered and large cohorts of mature students and students from the East being admitted. Within a few years, however, rather than encouraging reform in other West German higher education institutions, it began instead to conform to existing trends. The fading of idealism, evident in changing student attitudes and the desire of its professors for the same status as traditional academics, was accompanied by the loss of the Eastern bloc students after the building of the Berlin Wall and the eventual atrophy of most of the reform features of the university until in 1969 its original constitution was revoked and it became indistinguishable from its sister institutions in the West.[98]

In the Soviet Zone, later East Germany, the rhetoric of a return to the Humboldtian tradition was used to justify the politicisation of higher education policy to allow the diffusion of basic 'democratic' principles, the removal of the educational privileges of the bourgeoisie in favour of the proletariat[99] and higher education's ultimate transformation into a relatively compliant commodity industry. The Humboldtian ethic of the pursuit of pure scientific knowledge also, by some alchemy, became reconciled with that of Lenin which dictated that the study of pure science was only valid insofar as it could be applied

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[96] Geoffrey Bird, 'The Universities' in Arthur Hearnden (ed.), *The British in Germany: Educational Reconstruction after 1945*, (London, Hamish Hamilton, 1978), p 150

[97] Hearnden, *Education, Culture and Politics in West Germany*, (Oxford, Pergamon, 1976), pp 47 - 57

[98] James F. Tent, 'The Free University of Berlin: A German Experiment in Higher Education, 1948 – 1961', in Jeffry M. Diefendorf, Axel Frohn and Hermann-Josef Rupieper (eds), *American Policy and the Reconstruction of West Germany, 1945 – 1955*, (Cambridge, Cambridge University Press, 1993), pp 244 – 256

[99] Paletschek, 'The German University Idea', p 52

to technology. The aim was the pursuit of the 'Scientific and Technological Revolution' which would continually force upward the need for more and better qualifications in a virtuous cycle with continual technical progress, as well as demonstrating the superiority of a socialist system over capitalism.[100] Thus, somewhat ironically, the foundation of a totalitarian regime with a very different conception of democracy to that of the West was associated with what could be regarded as a more liberal and egalitarian framework for higher education.

Conclusion

For much of the nineteenth century, Germany's higher education system was held in extremely high esteem internationally because of the excellence of its scientists and the wealth of scientific breakthroughs produced. Nevertheless, the institutionally rigid and bureaucratic nature of the organisation of the universities and the elitist disposition of its professoriate hindered its coming to terms with the industrialisation of the country, consequent societal change and the necessary modernisation of higher education and research. Much of the country's scientific reputation and economic strength, particularly in the latter half of the nineteenth century and the beginning of the twentieth century, was arguably due rather to the rise of extra-academic establishments. These concentrated on applied science and technological development as opposed to the 'pure' or basic research carried on in the universities. Both applied and basic research in Germany, however, lost ground to the more entrepreneurial and progressive research programmes of the American universities which opened up serious technological gaps between the two countries.

Academia struggled to come to terms with the threat to its social status and influence created by an increasingly democratic political system following World War One, the effects of hyperinflation, the development of a larger and more egalitarian student body, the introduction of newer and more practically-oriented disciplines and a wider variety of institutions which did not conform to what it regarded as the true purpose of higher education. However, in its tacit support for National Socialism as a means of rejecting democratic pluralism and restoring a strong society, academia became complicit in the further destruction of its own values and a vastly increased emphasis on technology in higher education in order to promote Nazi ideology and feed the war machine. Moreover,

[100] Margrete Siebert-Klein, *The Challenge of Communist Education*, (New York, Columbia Univeristy Press, 1980), p 63

the expulsion of large numbers of the nation's best scientists and researchers on ideological and political grounds exacerbated the damage to science and technology wrought by growing isolation from the international scientific community, leaving Germany far behind in what would prove to be some of the most important areas of research for the future.

The end of the Second World War heralded the advent of more radical political change in society. However, in the academic field, the effects of National Socialist policy prompted the ostensible reversion to the safety blanket of the pre-war Humboldtian neo-humanist tradition. In the West, this involved the return of the traditional undemocratic stranglehold of university governance by the academic corporations, which even before WWII had proved unequal to the challenges of a modernising society. The implications for egalitarianism, scientific and technological progress and economic growth were, therefore, less than auspicious. The East, meanwhile, swapped one authoritarian regime for another. A heavy emphasis on applied science and technology and the stress on the universities as the drivers of economic growth would fail for many reasons, among them the imposition of a repressive and totalitarian culture which militated against the effective pursuit of learning and a centralised planning system which was too cumbersome and unwieldy to be able to respond effectively to the challenges facing the new state.

In the years following the war both countries experienced a period of spectacular economic growth and reconstruction. West Germany especially became a dynamic economic force and assumed a crucial geopolitical role in the developing European Economic Community. East Germany similarly reinvented itself and became one of the best-performing socialist countries of East Central Europe with a flourishing GDP growth rate. It has been argued, however, that the type of practical skills and labour required for the post-war reconstruction of both countries were those taught at lower scholastic levels. The state of the higher education system was thus of less relevance to immediate post-war growth. Its significance for long-term economic prosperity, however, would prove to be much greater. Firstly, the gaps in technology which had developed between both Germanys and the USA highlighted the need for a much more innovative and entrepreneurial approach to fundamental research in the universities in order to support the institutes of applied technological research. Secondly, deficiencies in highly trained manpower drew attention to the inadequacy of the existing graduate population to cope with the demands of rapid technological advance and to sustain competitiveness internationally.

The following chapter will explore the development of the higher education system in West Germany until 1969.

Chapter 3

Reform and Expansion of West German Higher Education 1945 – 1969

At the end of the Second World War the system of higher education in West Germany was in a fairly poor state. The loss of thousands of professorial staff through the purges of National Socialism and as casualties of war and through denazification (although a substantial majority were reinstated by the early 1950s) was complicated by the amount of physical damage to many of the institutions and the general national impoverishment which greatly affected plans for rebuilding in some cases, expansion in others. The longer-term deleterious effects of the policies of the interwar years and those of National Socialism on science and research has been discussed in chapter two, but they had left Germany isolated from the international scientific community and technologically behind much of the rest of the Western industrialised world in a number of important disciplines. The first imperative, therefore, was to re-establish a functioning and functional system of higher education in order to redress the damage, both physical and intellectual, and start the process of technological catch-up while training a new generation of academics and researchers and providing the appropriate highly trained personnel required by society and the economy in the second half of the twentieth century.

As discussed in the previous chapter, however, despite the efforts of the Allied powers in the West, the *Hochschulen* re-opened in the institutional format which had existed prior to National Socialism. Crucially, the academic senates were also given the freedom to draw up their own constitutions, giving them greater freedom to limit the extent of state intervention in university matters. Thus, the new Heidelberg University constitution described the restored university as "an organic order of spiritual protection and learning …against the incursion of fanatical masses of students and instructors in the determination of university questions".[1] This was to include only a limited number of students, predominantly male, which would create a new "geistesaristokratische Ordnung" [2] (aristocratic intellectual order). Nevertheless, a significant expansion of the higher education system took place, although it would be fair to say that until the mid-1960s this was less the result of planning than of a combination of coincidences. Among these were a

[1] Karl Jaspers, Gustav Radbruch and Walter Jellinek from OSS Field Intelligence Study 41, cited in Steven P. Remy, *The Heidelberg Myth: the Nazification and Denazification of a German University,* (Cambridge Mass., Harvard University Press, 2002), p 120

[2] Karl Jaspers quoted in Remy, *The Heidelberg Myth*, p 120

sharp increase in population following the war and the increasing egalitarianism of society.[3] More compellingly, over time the perception of large and widening gaps in technology between West Germany and the USA which threatened Germany's future international competitiveness and which contributed to a 'brain drain' of the country's most talented, largely to the USA, highlighted the need for a root and branch structural reform of the entire education system from the primary to the post-doctoral level. The result was a concerted effort to achieve the expansion of the system in order to try and produce, in a timely fashion, the type of graduates needed by the labour market and to expand the technological boundaries.

It became increasingly obvious over the period under consideration, however, that the nature of the expansion was creating a considerable number of problems. While the demand for higher education increased, the numbers of the teaching body, the facilities and the finances could not keep pace. A numerus clausus had to be introduced for a growing number of subjects and many of those who had expected to easily find employment commensurate with their status as graduates were disappointed. The humanities degrees with which most graduated often did not correspond to the requirements of the labour market. The aim of this chapter is to explore the imperatives for the expansion and reform of higher education and the subsequent struggle for adjustment within the higher education system. In relating the changes in higher education to the development of West German industry over the period in question and, by extension, to the development of the labour market, I aim to assess the significance of these to economic growth especially through the Golden Years of economic growth in the 1950s and 1960s.

Restoration and Reconstruction

One of the most obvious problems facing higher education after May 1945 was the level of physical damage to institutions caused by war. Thus, a first imperative was simply reconstruction. Rebuilding, however, required vast amounts of money and considerably more time than that needed to build domestic dwellings because of the need for complicated equipment and interior outfitting. The position of the *Technische Hochschulen* was particularly difficult as, apart from war damage, many of the industry-oriented research institutes in the technical field had been destroyed or dismantled, whilst

[3] David Schoenbaum, *Hitler's Social Revolution: Class and Status in Nazi Germany 1933 – 39*, (New York, WW Norton and Co. Inc. 1980) argues that this had to some extent taken place during the era of National Socialism, although this did not appear to apply to the make up of the student population

others had been limited solely to conducting research required for the Nazi war effort.[4] The cases of the *Rheinisch-Westfälische Technische Hochschule* in Aachen (RWTH) and the University of Heidelberg illustrate the extremes in the situations of many *Technische Hochschulen* and universities at the time and the problems which arose during the decade following the war's end. By the end of the war, over 70 percent of the RWTH had been destroyed. In contrast, the University of Heidelberg was one of the few not destroyed by the war, but having resumed operations in 1946, had outgrown its campus in the medieval part of town by the early 1950s. By 1958, many of the new students in the summer semester were even being temporarily accommodated in campsites because, although the site for a second campus had been identified, there was inadequate funding for expansion. Nor was there sufficient money for the modernisation of some of the (much) older buildings as most state funding and scarce building materials were being allocated to the reconstruction of those areas which had suffered the worst of the destruction.[5]

A second problem facing higher education as a result of the war was a lack of appropriately qualified teaching staff. Very few of those expelled from Germany by the Nazis wished, or were encouraged, to return afterwards,[6] and denazification was initially extensive. For example, at the RWTH in the British Zone only one docent out of the entire teaching body, professor of metallurgy Werner Geller, survived the initial denazification process. However, subsequent action varied somewhat depending on the zone of occupation. For instance, the British brought fewer than one-eighth of former Nazis to trial than did the American Zone. In consequence, although some of the accused academics chose to emigrate and a few were tried and found guilty, the vast majority chose to appeal against the decision, with the result that by 1950 37.4 percent had already been reinstated. Consequently, the RWTH (in the British zone) was able to resume teaching in 1947, albeit with only 250 students compared to a high point of 14,000 before the war.[7] Nationally, reinstatement rose dramatically throughout the 1950s as the occupying forces somewhat pragmatically set aside ethical considerations given the development of the Cold War, the need for reconstruction and, in particular, a desperate need for more doctors in order to avert the threat of a public health catastrophe.[8]

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[4] Paul Luchtenberg, 'Bericht über den Protokoll über die Sitzung des Unterausschusses "Förderung der Forschung" im Ausschuß für Kulturpolitik' 24.6.53 p 5, in BArch B 304/312/1
[5] D. Wilhelm Hahn, 'Bericht über die Situation der Universität Heidelberg vor der Sonderkommission des Wissenschaftsrates am 20.1.59', in BArch B 247/30
[6] Remy, *The Heidelberg Myth*, pp 116; 141 – 144
[7] Geschichte der RWTH Aachen 1945 – 2003, http://www.archiv.rwth-aachen.de/rea/Seite/geschichte_heute.htm (accessed 10.1.2007)
[8] Remy, *The Heidelberg Myth*, pp 123, 128; see also Mitchell G Ash, 'Scientific Changes in Germany 1933, 1945, 1990: Towards a Comparison', *Minerva*, Vol. 37, pp 333 – 334

By 1958 student numbers in the RWTH Aachen had increased to over 7,200[9] and in the University of Heidelberg from their 1938 figure of 1,844 to 7,427, including 1,200 foreign students from 64 different countries drawn by Heidelberg's reputation as "a romantic student paradise".[10] Consequently, there was not only a need to rebuild and re-equip with increasingly costly modern research equipment, there was also a dire shortage of teaching personnel to cope with the steadily increasing student numbers.[11] In 1958 the RWTH was struggling to maintain a full professor/student ratio of 1:50 and an assistant professor/student ratio of 1:20 with particular difficulties in the areas of construction engineering, machine engineering, electro technology, mining and metallurgy.[12] By 1962, however, virtually the same number of professors and docents were coping with an increase in student numbers from 7,200 to 10,400 (which translated to an assistant professor/student ratio of 1:38). There was, nevertheless, strenuous resistance from the academic senate to the *Wissenschaftsrat's*[13] suggestion of the installation of parallel professorial chairs in popular subject areas to ease the teaching burden as it was felt that this would be too difficult administratively and would "affect the comfort (*Gemütslage*) of the professoriate".[14]

The Pre-reform Education System

The reversion to the federal pre-National Socialist structure and organisation of higher education (re)created a highly heterogeneous assembly of higher education institutions where academic freedom and structural differentiation were jealously guarded. Following the creation of the Federal Republic, the autonomy of the individual *Länder* in the administration of the educational system, reinforced in the *Grundgesetz* (Basic or Fundamental Law) passed in 1949, demonstrated a number of serious flaws in operation.

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[9] 'Vermerk über die Ergebnisse des Besuchs der Begehungsgruppe bei der Technischen Hochschule Aachen am 30.1.62', p 1 in BArch B 247/29

[10] Hahn, 'Bericht über die Situation der Universität Heidelberg vor der Sonderkommission des Wissenschaftsrates am 20.1.59', 20.1.59, p 2 in BArch B 247/30

[11] Luchtenberg, 'Protokoll über die Sitzung des Unterausschusses "Förderung der Forschung" im Ausschuß für Kulturpolitik', 24.6.53, in BArch B 304/312/1

[12] 'Vermerk über die Ergebnisse des Besuchs der Begehungsgruppe bei der Technischen Hochschule Aachen am 16.12.58', pp 2 – 4, in BArch B 247/29

[13] Advisory body founded in 1957 and funded by both federal and Land parliaments to advise and make recommendations to both federal and Land governments on all matters concerning universities, Technische Hochschulen, Fachhochschulen and research institutions and on the competitiveness of West German science. It is also responsible for the accreditation and evaluation of existing and new institutions.

[14] 'Vermerk über die Ergebnisse des Besuchs der Begehungsgruppe bei der Technischen Hochschule Aachen am 30.1.62', pp 2 – 4, in BArch B 247/29

Despite a constitutional mandate to provide "equal living conditions",[15] there was a horribly confused patchwork of largely unregulated public, private and denominational schooling at the lower levels. A study conducted in Baden-Württemberg, for example, identified around 110 different types of school provision in that state alone.[16] This disparity of provision inevitably had implications with regard to access to the *Gymnasien*, then the sole entry route to higher education, in that some regions simply did not have one. This was accompanied by wide differences in curricula and the failure of some *Länder* to recognise the academic qualifications issued in others, making the option of moving to a different area to pursue upper secondary or tertiary education extremely difficult. Some *Länder* were unable to provide the necessary foreign language tuition mandatory for access to *Gymnasium*. For example, only 1.7 percent of school pupils in Rheinland-Pfalz and 3.4 percent in Nordrhein-Westfalen received this, compared to 46.9 percent in Schleswig-Holstein and 73.6 percent in West Berlin.[17] All *Länder* actively discriminated against females in the allocation of places in secondary education. Because the classics and the natural sciences were frequently deemed inappropriate for female minds, often their only option was a Modern Languages *Gymnasium* carrying much less academic cachet, providing that such an institution existed in the region. Moreover, in some *Länder*, such as Nordrhein-Westfalen, all education was resolutely single-sex. If co-education was not tolerated within the region, the lack of funding for establishing new girls-only *Gymnasien* meant a de facto denial of opportunity to roughly half the school-age children in these areas.[18] Thus, in 1950 the percentage of women among the students attending West German universities was only 19.7%.[19]

Attempts were made to unify provision across the country, namely the setting up in 1948 of the *Ständige Konferenz der Kultusminister* (Standing Committee of the Ministers of Culture or KMK) representing all the different *Länder*. Far from achieving its aims, however, it was described as "a highly constraining and extremely cumbersome system of negotiated coordination"[20] which by 1964 still could not agree even as to the

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[15] Fritz W. Scharpf, 'No Exit from the Joint-Decision Trap? Can German Federalism Reform Itself', Max Planck Institute for the Study of Societies Working Paper 0005/8, September, 2005, pp 3 – 4, http://www.mpifg.de/pu/workpap/wp05-8/wp05-8.html (accessed 14.3.2006)

[16] Tableau des baden-württembergischen Schulsystems cited in 'Protokoll des Expertengespräches über Fragen der Bedarfsberechnungen am 17.1.69', p 8, in BArch B 247/24

[17] Georg Picht, *Die deutsche Bildungskatastrophe*, (Olten und Freiburg im Breisgau, Walter-Verlag, 1964), pp 34 - 35

[18] Arthur Hearnden, 'Education in the British Zone', in Arthur Hearnden (ed), *The British in Germany: Educational Reconstruction after 1945*, (London, Hamish Hamilton, 1978), p 18

[19] R. Rytlewski and M. Opp de Hipt, *Die BRD in Zahlen 1945/49 – 1980,* (München, Verlag C.H.Beck, 1987), p 220

[20] Scharpf, 'No Exit from the Joint-Decision Trap?' pp 12 – 13

standardisation of the start of the academic year.[21] Moreover, by 1963 still only 54 percent of the age group 6 – 24 was in full or part-time education in West Germany compared to 83 percent in the USA, reflecting the availability of mass secondary education in both countries.[22] In 1953 the federal *Bundesministerium des Innern* (Ministry of the Interior) had set up an advisory body called the *Deutscher Ausschuss für Erziehungs- und Bildungswesen* (German Commission for Education), independent of political party influence and ministerial bureaucracy, in order to try to create some cohesion and more equality of opportunity. Unfortunately, its recommendations were purely advisory and there was no compulsion on the part of the *Länder* to adopt any of them. Although its chairman, *Oberbürgermeister* Pfizer, acknowledged the difficulties posed by the cultural sovereignty of the *Länder*, not least by their "ever-changing political constellations with different demands", he asserted that "no-one would want dreary regimentation" instead.[23]

The necessity for conflict resolution between institutions and *Länder* in order to be able to develop an effective common stance towards the federal government, ultimately led to the "disproportional influence of status-quo interests".[24] The agency which should have facilitated the process and provided effective leadership – the *Westdeutsche Rektorenkonferenz* (Committee of West German Rectors or WRK)[25] was itself subject to internal dissent largely because its members were constrained to represent the policy of their individual institutions. Moreover, the creation of the *Wissenschaftsrat* in 1957, with its very different remit, complicated the policy-making process still further. Policy on higher education thus required the cooperation of the federal government, the individual *Land*, that of every institution of higher education within it as well as the input of all the above organisations and numerous professional organisations, all working in a spirit of mutual distrust and conflicting interests described as "organised anarchy and professional bureaucracy at once".[26] It becomes obvious, therefore, that the defining characteristics of policy-making in the higher education sphere were multilevel bargaining and resistance to reform which ensured that a lack of cohesion and associated problems persisted. The

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[21] Lenz, 'Protokoll des Bundestages, 118. Sitzung', 4.3.64, reprinted in Picht, *Die deutsche Bildungskatastrophe*, p 122

[22] OECD, *Gaps in Technology*: *Comparisons between Member Countries in Education, Research and Development, Technological Innovation and International Economic Exchanges*, (Paris, OECD, 1970), pp 35 - 36

[23] Pfizer, 'Vertrag am Stipendiatentreffen der Alexander-von-Humboldt Stiftung, Bonn, 2 July 1956', p 5 in BArch B 154/53

[24] Scharpf, 'No Exit from the Joint-Decision Trap?', pp 2 – 4

[25] Organisation originally conceived in 1949 consisting of representatives of all the Hochschulen with the objective of the clarification and resolution of matters common to all Hochschulen.

[26] Helga A. Welsh, 'Disentangling the Reform Gridlock: Higher Education in Germany', Working Paper 02.7, Program for the Study of Germany and Europe, Wake forest University, 2001, p 6, http://www.ces.fas.harvard.edu/publications/docs/pdfs/Welsh02.pdf (accessed 14.3.2006)

cumulative effects led to an ongoing, nationally and internationally recognised decline in the national educational performance of German youth.[27]

Imperatives for Reform and Expansion

For its part, the immediate concern of the post-war government, inevitably, was recovery and reconstruction rather than revamping the higher education system – "*Primum vivere, deinde philosophari*"[28] (first survive, then philosophise) – and for a time it appeared that the existing West German educational system was furnishing the country with exactly the type of labour force it required for the task. The huge majority of pupils left the *Volksschule* (primary school) to attend *Berufsschule* and *Realschule* to learn the basic skills and trades which provided the type and level of skills and labour needed to take West Germany through the early reconstruction phase and maintain an impressive rate of economic recovery. Thus, if the perceived need of the economy for lesser skilled workers to man the growing manufacturing and construction sectors was being met, reform and expansion of higher education might well have appeared superfluous.[29]

Technical deficit

Nevertheless, there were indications relatively early on of serious concerns about the higher education sector, the shortage of highly qualified personnel and the need to expand initiatives in basic research. For example, *Deutsche Forschungsgemeinschaft* (DFG) president Ludwig Raiser argued that it was only the creative scientific work of sufficient numbers of young scientists which could "guarantee a bearable standard of living for this overpopulated country between the Alps and the North Sea". He also, rather presciently, pointed out that neglect of this area would lead to a serious lack of junior academics in the *Hochschulen* within ten or fifteen years.[30] By the end of the 1950s, the divergence between the attitudes of academia and the federal government towards the expansion of higher education was becoming increasingly evident. On the one hand, the *Wissenschaftsrat* was flagging up warnings of a deficit of tens of thousands of technical experts, compounded by institutional overcrowding and too few teaching personnel in

[27] 'Große Anfrage der Fraktion der SPD' 20.4.56, p 1 in BArch B 304/312/1
[28] Paul Mikat, 'Auszüge aus einem Referat am Bundesparteitag der CDU', March 1964, reprinted in Picht, *Die deutsche Bildungskatastrophe*, p 184
[29] Lutz, cited in Ulrich Teichler, Dirk Hartung, Reinhard Nuthmann, *Education and the Needs of Society*, (Windsor, NFER Publishing Company Ltd., 1980), p 37
[30] Ludwig Raiser, 'Zur Jahresversammlung des "Stiftenverbandes"', *Hochschul-Dienst*, Jahrg. VI, No. 8, 23rd April 1953, pp 142 – 144, in BArch B 304/312/1

higher education.[31] On the other, academia was advocating the restriction of student numbers in *Technische Hochschulen*. The ostensible reason for this was that across the country as a whole, there were 55,000 students currently studying in *Technische Hochschulen*, with 8,000 set to graduate in 1962 who faced a lack of suitable employment opportunities.[32] The federal government's perception was altogether different however. A one-year administrative agreement had already been drawn up in 1957 committing federal funding for the expansion of capacity in the engineering colleges because of the assessment of the *Wissenschaftsrat* that there was "an economically damaging shortage of engineers, particularly in the areas of mechanical engineering, electrotechnology and electronics". This agreement was subsequently prolonged and a further significant expansion of the engineering colleges approved in light of the increasingly urgent nature of the problem and because large numbers of interested students were being turned away every year.[33] Although the discrepancy between the demand and supply of engineers was becoming ever more apparent, before the building of the Berlin Wall in 1961 West Germany was able to plug the gaps in qualified manpower to a considerable extent through the influx of refugees from East Germany. The following table demonstrates the extent of refugee flight from East Germany arranged by age group:

[31] Giselher Wirsing cited in Georg Picht , *Die deutsche Bildungskatastrophe*, p 14
[32] 'Vermerke über die Schlußbesprechung des Besuchs am 1.2.62', in BArch B 247/29
[33] See 'Niederschrift der Konferenz der Ministerpräsidenten der Länder der BRD', 16th – 17th October 1958, pp 26 – 27, in BArch B 304/312/2. Funding for this expansion was approved as early as 1953, but five years of argument then ensued in the *Kultusministerium Konferenz* as to whether it should actually be used for the expansion of capacity or whether the money should be used instead simply to improve study programmes in the existing engineering schools. Expansion only went ahead when a ruling of the federal government threatened to withdraw funding altogether

Table 3.1

Refugees from the German Democratic Republic 1949 – 62

Year	Total in 1000s	Age Group as a percentage of the total					
		< 14	14 – 18	18 – 25	25 – 45	45 – 65	> 65
1949	129	-	-	-	-	-	-
1950	198	-	-	-	-	-	-
1951	166	-	-	-	-	-	-
1952	182	17.8	11.1	23.7	29.3	16.7	1.4
1953	331	22.7	11.8	14.2	30.0	18.8	2.5
1954	184	21.0	12.9	15.2	29.4	17.2	4.3
1955	253	17.4	9.6	25.5	27.0	16.5	4.0
1956	279	17.5	9.4	22.1	27.4	18.9	4.7
1957	262	16.5	9.2	26.5	26.2	16.7	4.9
1958	204	17.3	8.1	22.7	25.2	20.5	6.2
1959	144	15.4	7.1	25.8	21.7	20.6	9.4
1960	199	17.4	5.7	25.7	23.4	20.7	7.1
1961	207	17.3	5.3	26.6	23.9	19.6	7.3
1962	21	8.7	4.6	25.4	21.9	13.6	25.8

Source: R. Rytlewski and M. Opp de Hipt, *Die BRD in Zahlen 1945/49 – 1980*, (München, Verlag C. H. Beck. 1987), p 58

There are a number of points to be made with regard to this table. Firstly, large numbers of GDR residents were leaving for the West, in some years over a quarter of a million. Of these, two of the largest groups (including the largest group overall) were in the age bands 25 – 45 and 45 – 65, a huge proportion of whom were industrial and technical specialists. At its height, the brain drain encompassed around 100 highly qualified engineers every month.[34] Secondly, the second largest group is in the age band 18 – 25. While many of this group may have been economically active, a significant number appear to have left because of the restricted educational and professional opportunities in the East. The necessity and means of incorporating these into the higher education institutions of the West presented a further challenge to an already overstretched system. Another substantial proportion of the refugees consisted of the under-14 and 14 – 28 age groups, who would require secondary and tertiary education. If it can be assumed that many of these were the offspring of the more highly qualified refugees, it is equally likely that many of them would also be seeking a higher education. Thirdly, the dramatic fall in refugee numbers after 1961 highlighted the extensive shortfall of West Germany's own provision of engineering scientists in particular. This was, moreover, exacerbated by the West's own smaller, though still significant, migration of the highly qualified. This "voluntary

[34] Dolores Augustine, 'Frustrated Technocrats: Engineers in the Ulbricht Era', in Kristie Macrakis and Dieter Hoffman (eds), *Science under Socialism: East Germany in Comparative Perspective*, (Cambridge Mass., Harvard University Press, 1999), p 185

enlistment in the intellectual foreign legion"[35] was largely to the USA. In comparison with the rest of Europe, the number of scientists and engineers emigrating from Germany was comparatively high as the following table demonstrates:

Table 3.2

Immigration by scientists and engineers into USA by last country of residence 1956 - 1966

Source Countries	1956	1962	1963	1964	1965	1966
Belgium	18	18	24	25	33	37
France	79	47	89	82	103	112
Germany	**339**	**277**	**353**	**425**	**370**	**346**
Italy	72	62	53	38	58	107
Netherlands	105	113	72	60	80	71
Great Britain	433	659	910	1,006	941	1,251
Sweden	144	53	81	90	106	95
Total Europe	**1,679**	**1,617**	**2,085**	**2,277**	**2,231**	**2,715**

Source: OECD, *Gaps in Technology*, (Paris, OECD, 1970), p 55

Bearing in mind that these are purely 'inflow' figures and do not show figures for returnees, it is nevertheless clear that, with the exception of Great Britain, West Germany experienced a much greater outflow of scientists and engineers over the period 1956 – 1966 than the rest of Western Europe. While small relative to the numbers emigrating from the East, there were, nevertheless, serious worries about the consequent "shocking vacuum among qualified researchers" in West Germany and the "squandering of intelligentsia potential" (*Intelligenzpotentials*).[36] Of particular concern in the context of the technology gap was that of all the West German scientists in the USA in 1964, 71.1 percent held doctorates,[37] and the trend demonstrated steadily increasing numbers of doctorate holders emigrating over the period from 43 in 1956 to 71 in 1964.[38] Moreover, of all the scientists and engineers emigrating to the USA, engineers outnumbered scientists by a ratio of more than 2:1,[39] so it can probably be assumed that a similar proportion applied to the German emigrants. In one sense, this could be interpreted as confirming the suspicions of the professoriate regarding lack of suitable employment for graduate engineers. More compellingly, however, it clearly implied a net loss to the economy of its most highly qualified engineers and a net gain to the USA of technological potential.

[35] Paul Luchtenberg, 'Zentrale Verwaltung der deutschen Forschungspflege als Zeitgemässe Forderung' in *Hochschul-Dienst*, Jahrg.VI/Nr.8, 23.4.53 p 145 in BArch B 304/312/1
[36] Paul Luchtenberg, 'Zentrale Verwaltung der deutschen Forschungspflege als Zeitgemässe Forderung', p 145
[37] OECD, *Gaps in Technology*, p 58
[38] OECD, *Gaps in Technology*, p 61
[39] OECD, *Gaps in Technology*, p 57

The brain drain also had implications for higher education in that the loss of so much post-doctoral talent was one of the reasons for a substantial and growing deficit in the number of teaching staff in the *Technische Hochschulen,* particularly of *Assistenten* (junior academics) who undertook a great deal of teaching and supervision duties. The independence and salaries of the positions offered abroad made them very attractive. The situation was exacerbated by the poor remuneration and promotion prospects in academia, especially when only the salaries of senior and fully tenured professors were able to compete with those of industry and the highly cumbersome professorial appointment procedure meant that attaining full professorship was extremely difficult. For example, of the 154 who received *Habilitation* (advanced degree qualifying an academic to teach at university level) in the University of Heidelberg between 1959 and 1964, only 27 had been appointed as full professors by June 1964.[40] Indeed, the *Allgemeine Studenten-Zeitung* pointed out that, for the vast majority of *Assistenten*, the idea of having the salary and pension entitlement of a similarly aged skilled worker in industry seemed "almost like a fantasy".[41] The predictable consequence was that a substantial number of professorial chairs remained unoccupied in subjects as diverse as administrative law, agricultural mechanical engineering, business economics, marketing, anthropology and theology, at a time when the growing numbers of students necessitated an increase.[42]

Despite the steady increase in student numbers since WWII, (for instance, RWTH Aachen student numbers by the winter semester of 1962 had reached 10,400[43] and Heidelberg's student population had increased to 11,328 by the summer semester of 1965),[44] the government's fear in the early 1960s was that student numbers were at levels low enough to be incapable of sustaining technological and economic growth. Moreover, even though only a four percent increase in *Abiturienten* (those with the right to proceed to higher education) numbers was expected by 1970 as the following table taken from Picht's *Die Deutsche Bildungskatastrophe* demonstrates, the *Kultusminister* for Nordrhein-Westfalen

[40] 'Niederschrift über die Sitzung mit Mitgliedern des Wissenschaftsrates am 20. Februar 1962 in Heidelberg' p 8, in BArch B 247/30
[41] 'Sind Wissenschaft und Forschung wirklich frei?' in *Einigung: Allgemeine Studente-Zeitung*, Sonderdruck aus Nr. 4, 6. Jahrgang, February 1959, in BArch B 154/53
[42] Luchtenberg, 'Bericht über den Protokoll über die Sitzung des Unterausschusses "Förderung der Forschung" im Ausschuß für Kulturpolitik', 24.6.53, p 5, in BArch B 304/312/1
[43] 'Vermerk über die Ergebnisse des Besuchs der Begehungsgruppe bei der Technischen Hochschule Aachen', 30.1.1962, p 1, in BArch B 247/29
[44] 'Hochschulerhebung – Spezielle Fragen – Universität Heidelberg', 16.12.65, p 3 in BArch B 247/30

was forced to admit in 1964 that there were already 50,000 more candidates than places in the existing *Hochschulen.*[45]

Table 3.3

Predicted growth in numbers of Abiturienten till 1970 (based on average annual growth rate from 1959)

Country	Abiturienten 1959 in 1000s	Predicted Abiturienten 1970 in 1000s	Predicted % Increase
Yugoslavia	38.1	94.4	148%
Norway	4.9	13.0	165%
France	**59.1**	**150.0**	**154%**
Belgium	10.4	20.8	100%
Sweden	10.5	25.0	138%
Italy	55.6	116.6	110%
Denmark	3.8	8.5	124%
Netherlands	10.0	20.0	100%
W Germany	**51.4**	**53.3**	**4%**

Source: OECD Third Survey of Eductional Provision in Picht, *Die Deutsche Bildungskatastrophe*, p 27

Picht pointed out, moreover, that the predicted 154 percent increase in *Abiturienten* in France would take the absolute number there to more than that of West Germany despite having a much smaller population. If, as he suggested, the intellectual potential of a country defines the competitiveness of its economy, the level of its GDP and ultimately its political dominance, then by 1970 it would be France which would be at the centre of Europe, while Germany would be playing a subordinate role solely because of the backwardness of its education system.[46] Ernst Schneider, president of the *Deutscher Industrie- und Handelstag*, (German Chamber of Industry and Commerce) contended that the relevant authorities had been very slow to recognise the connection between spending on science, research and education and economic growth.[47] Although until 1958 the funding for schools and universities had risen gradually, it had then fallen steadily from 3.31 percent of GDP to 3.26 percent in 1959 and 2.99 percent in 1962.[48] By 1964 it was at a low of 2.2 percent of GDP,[49] causing one opposition politician to assert that West Germany continued to "disport itself" as if it were still on a "pre-industrial playground".[50] Of the total spent on education in Germany, around 17.1 percent was devoted to higher

[45] Prof. Dr. Mikat, 'Bundesparteitag der CDU', March 1964, reprinted in Picht, *Die deutsche Bildungskatastrophe,* p 185
[46] Picht, *Die Deutsche Bildungskatatrophe,* pp 25 – 26
[47] Ernst Schneider quoted in Giselher Wirsing, 'Einführender Leitartikel aus *Christ und Welt*' in Picht, *Die Deutsche Bildungskatatrophe*, p 11.
[48] Picht, *Die deutsche Bildungskatastrophe*, p 17
[49] Statistisches Bundesamt, *Wirtschaft und Statistik*, (Stuttgart und Mainz, Verlag W. Kohlhammer GmbH), issue 1969, p 386
[50] Lohmar in 'Protokoll des Bundestages, 118. Sitzung 4.3.64', reprinted in Picht, *Die deutsche Bildungskatastrophe,* p 107

education putting it behind the USA (34 percent), Canada (20.3 percent), the UK (20.2 percent) and France (17.8 percent). Thus, a much higher proportion of young people in the USA were not only receiving, and graduating from higher education (7.6 percent of the total labour force) compared to that of Germany (3.9 percent), but Germany was the only one of the countries cited not to experience big increases in the graduation rates (0.2 percent in 1955 and 0.24 percent in 1963).[51]

Demographic Imperative

Another factor forcing the expansion of higher education was the population boom following WWII. The following table illustrates the demographic changes from 1939 to 1980:

Table 3.4

Population of West German Länder 1939* - 1980 by age groups (in 1000s)

Year	Under 6s	Of which under 1s	6 – 15	15 – 20	20 – 45	Total population
1939*	4089	-	5497	3586	15848	40258
1950	3963	750	7340	3455	16349	47674
1955	4620	788	6698	4652	17953	53199
1961	5281	958	6903	3682	19253	56175
1965	5959	1032	7353	3678	20960	59012
1970	5738	825	8321	3996	20827	60651
1975	4232	601	9054	4520	21552	61829
1980	3530	598	7657	5218	22112	61566

*the figures for 1939 were adjusted retrospectively from those collected in an industrial census of 1936 of the area covered by what ultimately became the FRG
Source: R. Rytlewski and M. Opp de Hipt, *Die BRD in Zahlen 1945/49 – 1980* p 38

The rapidly rising numbers in the age groups for all types of education is clear, as is the steady increase in the birth rate from the end of the war until 1965 which would inevitably translate into increased demand for education a few years on. Related to this, was an acute shortage of teachers at all levels of education, not only in the *Hochschulen*. The number of school pupils was expected to increase by around two million by 1970, and with the eventual nationwide introduction of a ninth year of compulsory basic schooling, this was likely to grow by a further 500,000. Within the same time frame, around 44 percent of teaching staff were expected to retire. According to government calculations a minimum of 419,988 new teachers would be required by 1970, while the "pedagogically desirable" number was 535,426. The former figure would only be achievable if an unfeasible 90

[51] OECD, *Gaps in Technology*, p 39

percent of all projected higher education students graduated as teachers; the latter figure would require a wholly impossible 120 percent.[52] According to the figures of the *Kultusministerium Konferenz*, the actual number of student teachers was likely to be only 45,000. The desperation of the situation was such that Prof. Dr. Mikat, *Kultusminister* for Nordrhein-Westfalen, was forced to send a telegram to the Federal Defence Minister requesting that all teaching graduates be exempt from national military service.[53]

Societal Change

Social change and the increasing public rejection of the use of education as an instrument of status distribution added to the pressure for change.[54] Writers such as Picht had highlighted the tiny proportion (six percent) of the relevant age cohort educated to higher education entry standard compared with other industrialised countries such as France, Austria, the Netherlands, Italy, the Scandinavian countries and the USA.[55] He even went as far as predicting the abrupt end of West Germany's spectacular post-war growth because the pace of international scientific and technological development increasingly created jobs requiring the sort of higher-level education which was not being provided by the existing system.[56] Moreover, the rapid growth of the service sector likewise required an increased number of employees with the sort of higher skill levels which were largely acquired in higher education. These developments had, to some extent, resulted in a polarisation of the employment market in that there was considerable and growing demand for highly qualified manpower, albeit less than that for unskilled or semi-skilled labour for manufacturing and construction, accompanied by a marked decline in demand for workers with mid-level qualifications.[57] To quote Mikat again:

> If we say today that to survive also entails the development of industries, the building of roads, the energy economy, food provision, agriculture etc., we can see that science, research and education also [now] belong to the area of 'first survive'… We have more and more social mobility, and thus more demands for intellectual mobility. There are already jobs today where knowledge of English is

[52] Georg Picht, *Die Deutsche Bildungskatastrophe*, pp 20 – 22
[53] Lohmar, in 'Protokoll des Bundestages, 118. Sitzung 4.3.64', reprinted in Picht, *Die Deutsche Bildungskatastrophe*, pp 105 – 107
[54] Davis, cited in Ralf Dahrendorf, *Class and Conflict in Industrial Society*, (London, Routledge and Kegan Paul, 1959), p 59
[55] Picht, *Die deutsche Bildungskatastrophe*, p 14, p 16, pp 20 - 30
[56] Picht, *Die deutsche Bildungskatastrophe*, p 66
[57] Ulrich Teichler, Dirk Hartung, Reinhard Nuthmann, *Education and the Needs of Society*, (Windsor, NFER Publishing Company Ltd., 1980), p 37

> required of even Volksschule graduates. Even [working for] the mass media demands extensive educational requirements which are often simply not available[58]

The level of social discrimination inherent in the existing system was also emphasised by Ralph Dahrendorf, who argued that social mobility had become crucial to the structure and functioning of industrial societies. He further suggested that the sort of social discrimination which disadvantaged the female, the poor and Roman Catholics in the existing education system, accompanied by the failure to fully exploit the talents of more of its citizens, could have serious social and economic consequences for the nation.[59] A further major source of public discontent lay in the fact that, even for those who could access higher education, there were simply not enough places in the most popular and prestigious courses to satisfy demand. The application of a numerus clausus was becoming progressively more common for courses such as medicine, dentistry, chemistry, biology, pharmacy, psychology, physics, mathematics and architecture, resulting either in the student having to wait to study the subject of choice, sometimes for years, or choosing another, less prestigious course.[60] Academia's reaction to change in the social structure of the *Hochschulen*, however, was not positive. In response to the introduction of state support for less well-off students, for instance, the professoriate argued strongly that financial help "represents one-sided and inflexibly applied support for socially weak and academically average students".[61]

General dissatisfaction with the system of higher education was greatly exacerbated by the effects of the counter-cultural revolution. The German roots of the social protest movement which made itself felt throughout the Western world in the late 1960s arguably stemmed from the social and cultural upheavals which took place during the 1950s due to the progressive westernisation, Americanisation and democratisation of the country. Laufs argues that a politically bored generation who had grown up through the long Adenauer era and which was not bound by the post-war social consensus between labour and capital, which had been in no small part responsible for the stability of the country and its spectacular economic growth, felt itself alienated from this "economic wonderland with its

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[58] Mikat, paper on education policy delivered at the Bundesparteitag of the CDU, March 1964, reprinted in Picht, *Die deutsche Bildungskatastrophe*, p 184

[59] Dahrendorf, *Class and Conflict in Industrial Society*, p 59; see also Dahrendorf, *Bildung ist Bürgerrecht: Plädoyer für eine active Bildungspolitik*, (Hamburg, Nannen-Verlag, 1965)

[60] 'Universität Hamburg Planungsstab', 1.5.73, in BArch B 304/858/1

[61] 'Bericht über die Situation der Universität Heidelberg von der Sonderkommission des Wissenschaftsrates am 20.1.59', in BArch B 247/30

civilised modernity".[62] A change in the 'Zeitgeist' saw the emergence of a politically aware and angry youth movement which tuned into events such as 'The Prague Spring', the 'Summer of Love' in California, the Chinese Cultural Revolution and the 'May Unrest' in Paris to name a very few. General mistrust of state authority resonated with that manifesting itself in North America and other West European countries in anti-Vietnam protest movements and campaigns against the 'establishment', the authoritarian structure of society and antiquated systems of government. Disenchantment with Western ideals led many to seek models in revolutionary leaders elsewhere, such as Che Guevara, Ho Chi Minh and Mao Tse Tung, leading to the development of 'New Left', represented in West Germany, by the SDS (*Sozialistische Deutsche Studentenbund*) which had a quasi-Marxist ethos and no less a goal than social revolution.[63]

The spiralling level of demand for higher education was accompanied by growing discontent at the ability of the system to provide what was wanted and a disinclination to be turned out at the other end as "good servants for capitalism".[64] Within the universities, there was increasing resentment regarding the lack of accountability of the professoriate; the virtual autonomy of the university senate which precluded any influence over decision-making on the part of the students; and, not least, against those professors perceived of as guilty of complicity with Nazi atrocities before and during the Second World War and left in situ. What initially started as token strikes and boycotts by "narcissistic, colourful and chaotic [youths] in alternative clothing",[65] developed momentum with criminal offences, violent assault, intimidation and breaches of the peace aimed at professors, other officials and those students unwilling to take part. Worst affected were the universities of Berlin, Frankfurt, Heidelberg and Tübingen.[66] In the Freie Universität Berlin, for example, terrorist minorities decided whether lectures took place or universities bodies met. This became extended to include the right of decision on the appointment of academic staff. Full professors were appointed according to their declared political beliefs. Some had still not even been granted their doctorates, far less completed habilitation (necessary for full professorship); others did not even attempt to achieve a doctorate. University leaderships

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[62] Adolph Laufs, 'Neunzehnhundertachtundsechzig – im bild eines Zeitgenossen von der anderen Seite', in Armin Kohnle and Frank Engehausen (eds), Zwischen Wissenschaft und Politik: Studien zur deutschen Universitätsgeschichte, (Stuttgart, Frank Steiner Verlag, 2001), p 218; Erica Carter, 'Culture, history and national identity', in Mary Fulbrook (ed.), *20th century Germany: politics, culture and society 1918 – 1990*, (London, Arnold, 2001), pp 264 – 265

[63] Prof. Dr. Margot Becke, 'Alma Mater Moribunda', May 1971, in BArch B 247/34, p 3

[64] Margot Becke, 'Alma Mater Moribunda', p 7

[65] Laufs, 'Neunzehnhundertachtundsechzig', p 220

[66] Laufs, 'Neunzehnhundertachtundsechzig', pp 219 – 221

'very often' allied themselves with these left wing terrorist groups.[67] Those professors who chose to stand up against the groups, therefore, frequently found themselves without effective support from rector, dean or head of department resulting in either their early retirement or removal to a different university and replacement with more 'politically acceptable' substitutes. In at least one case, that of Johannes van der Meulen of Heidelberg University in 1969, the end result was suicide.[68] As a result, research and teaching were severely affected and the "quality of education has fallen by a frightening degree."[69] The movement shifted focus even further under the influence of young left-wing radicals to take in anything from anti-Vietnam rallies, violent demonstrations almost anywhere and the burning down of department stores and subsequent death of hundreds in the name of the destruction of capitalism. Ultimately, the spiral of violence was to lead some young protesters, such as Gudrun Ensslin, Andreas Baader and Ulrike Meinhof into outright terrorism.[70]

Within the context of this thesis, however, it is, worth pointing out that the subjects worst affected by the actions of the student protesters tended to be the humanities (especially philosophy, history and interestingly, theology), political science, sociology and psychology.[71] The faculties of engineering and the natural sciences, which are the primary focus of this thesis, were much less affected; however, given the general state of ferment in many of the universities and the change of ethos in the leadership of some, it is unlikely that these disciplines escaped many of the negative consequences of these occurrences.

The Technological Gap

Finally, the gaps in technology which had opened up between West Germany and the USA and which will be discussed at greater length later in the chapter provided a further, very compelling factor for reform and expansion. The graduation rate from higher education in science and engineering in the relevant age cohorts in the USA and Germany in 1964

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[67] Margot Becke, 'Alma Mater Moribunda', p 9; Mark Roseman, 'Division and Stability: the Federal Republic of Germany 1949 – 1989', in Fulbrook, *20th century Germany: politics, culture and society 1918 – 1990*, pp 190 – 191

[68] 'Conzes Behinderung in Heidelberg einer unter fünf Fällen', article in the Frankfurter Allgemeine Zeitung, 22.6.71, in BArch B 247/34

[69] Letter from Margot Becke to the Geschäftsstelle des Wissenschaftsrates, 21.6.71, in BArch B 247/34

[70] Laufs, 'Neunzehnhundertachtundsechzig', p 221; Volker Berghahn, *Modern Germany: society, economy and politics in the twentieth century*, (Cambridge, Cambridge university Press, 1982), pp 241 - 246

[71] Peter Dohms, 'Studentenbewegung und Überlieferungsvielfalt - das Beispiel Nordrhein-Westfalen', in *Der Archivar*, http://www.archive.nrw.de/archivar/index.html?http://www.archive.nrw.de/archivar/1999-03/archiv13.htm (accessed 8.12.2005), pp 3 – 7

showed huge discrepancies with that of the USA being 4.2 percent compared with 0.8 percent for Germany.[72] Lohmar highlighted the estimate of government experts that within twenty years (from 1964) around a third of US industry, more than half of its administration and a little less than a quarter of its agriculture would be fully automated, while in the Soviet Union top priority was being given to the funding of scientific research, automation and cybernetics. He also claimed that:

> If we do not take stronger measures than we have done… According to the figures of the KMK, [in 1980] there will be some 80,000 engineering students…This figure is a long way from being sufficient to cover the predicted demand for scientifically trained personnel…[73]

Reform and Expansion

The signing of the Königstein state agreement on scientific research in 1949 effectively allowed the federal government some access into the previously exclusive jurisdiction of the *Länder* on education and increased its influence over policy-making. This was extended through the creation of the federal Ministry for Scientific Research in 1962 and further agreements in 1964 and 1968 which again expanded the role of the federal government in guiding the development of higher education, albeit to a very limited extent.[74] As a result, the federal government was able to persuade the *Länder* that the best means of tackling West Germany's technological deficit and enhancing its international status was to reform and standardise the education system as a whole and expand the higher education system in particular.[75] As Federal Minister for Scientific Research Lenz argued:

> science must simultaneously be the at the tip of the pyramid and the foundation for a wide and solid education system, that in its turn finds its fulfilment in science… the importance of science for the development of society lies not only in its

[72] OECD, *Gaps in Technology*, p 39
[73] Lohmar quoted in 'Protokoll des Bundestages, 118. Sitzung 4.3.64', reprinted in Picht, *Die Deutsche Bildungskatastrophe*, pp 104 – 105
[74] Jan Erk, 'Federal Germany and Its Non-Federal Society: Emergence of an All-German Educational Policy in a System of Exclusive Provincial Jurisdiction', in *Canadian Journal of Political Science*, Vol.36, No.2, June 2003, p 307
[75] Teichler, Hartung and Nuthmann, *Higher Education and the Needs of Society*, p 36

> connection to the education system but above all in the results of scientific research. Scientific discoveries enrich…the lives of individuals and societies[76]

The numbers of *Abiturienten* had increased from a figure of 42,737 in 1957 to 59,851 in 1963. By 1966, however, through the opening up of the *Gymnasien* this number had almost doubled to 95,000 and continued to increase strongly thereafter. Of these, around 70 percent were expected to continue on to some form of higher education. The rise in numbers was helped by a doubling of the proportion of female *Abiturienten* to form 38.9% of the total in 1968, in itself something of a social revolution.[77] Additionally, new routes to higher education were created via the *Fachoberschule* (vocational schools at upper secondary level) allowing entry to specific institutions focusing on more vocational training, easier progress from *Fachhochschule* to *Hochschule* and the development of the *zweiter Bildungsweg* (the second way) allowing older students, and those without an *Abitur*, access to higher education by such means as evening classes and distance learning.[78] The following table gives an idea of the increasing numbers of *Abiturienten* over the period 1957 – 1971:

Table 3.5

Abiturienten numbers 1957 – 1971 (1957 = 100)

Year	Males	Females	Total
1957	100	110	100
1958	108.5	111.1	109.4
1959	117.3	26.4	120.4
1960	126.4	138.2	130.4
1961	130.6	143.5	135.0
1962	132.4	145.5	136.8
1963	133.2	153.5	140.0
1964	126.0	140.6	131.0
1965	110.9	119.2	113.7
1966 (spring)	113.7	132.3	120.0
1966 (Nov)	96.1	118.2	103.6
1967 (spring)	140.5	163.1	148.1
1968	157.8	196.5	170.9
1969	165.4	210.3	180.6
1970	169.9	223.8	188.1
1971	174.6	242.6	197.6

Source: Statistisches Bundesamt, *Wirtschaft und Statistik*, 1974, p 621

[76] Lenz, 'Protokoll des Bundestages, 118. Sitzung 4.3.64', reprinted in Picht, *Die Deutsche Bildungskatastrophe*, p 119

[77] Statistisches Bundesamt, *Wirtschaft und Statistik*, issue 1970, p 398

[78] Matthias M. Heister, 'Notes on Current Planning for Higher Education in the Federal Republic of Germany', *Oxford Review of Education*, Vol.11, No.3, 1985, p 256; for a more extensive description see Arthur Hearnden, *Education in the Two Germanies*, p 208

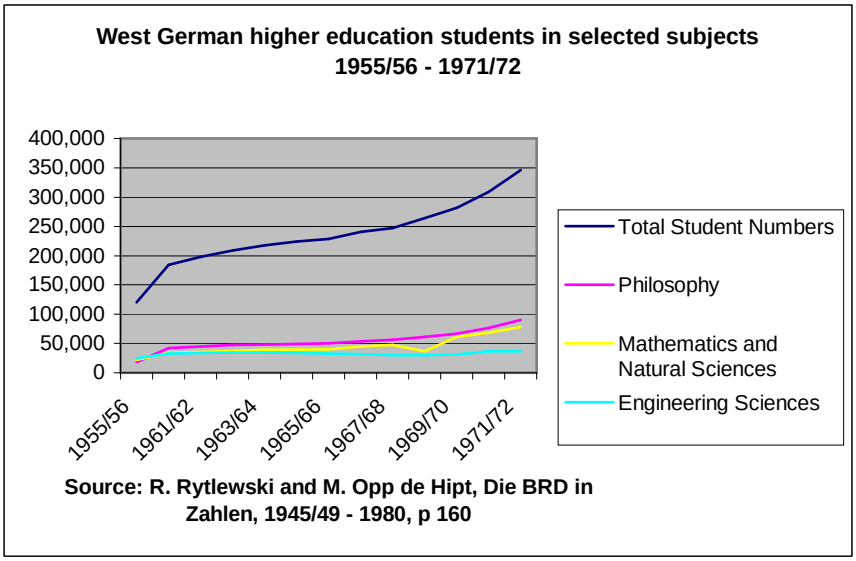
Somewhat pardoxically, although many of the measures were not universally liked by academia, the introduction of the *zweiter Bildungsweg* apparently received the strong approval of both the *Hochschulen* and the *Kultusministerien* of the *Länder,* being described as "very important" in statements to the press.[79] Thus, total student numbers in the higher education sector (excluding those not studying for some form of qualification), increased from 217,762 in the winter semester of 1963/64 to 346,045 in 1971/72.[80] Between 1965 and 1973, total spending on education rose by 183 percent (in nominal terms) compared with a rise in GNP of only 99 percent.[81]

Sectoral Development

The expansion took place in the face of the continuing emphatic rejection of the vast majority of academic senates that higher education should become in any way more practically oriented or relevant to modern life.[82] In line with the stipulations of the constitution that students should have a free choice of course and institution, the expansion was directed by social demand. This, however, led to an extremely uneven-handed development of the tertiary sector with serious implications for the government's goal of addressing West Germany's technological deficit and promoting economic development, as the following chart makes clear:

[79] 'Der "zweite Bildungsweg" soll gefördert werden' in *Frankfurter Allgemeine Zeitung*, 27.5.1957, BArch B154/50
[80] Statistisches Bundesamt, *Wirtschaft und Statistik*, issue 1974, p 621
[81] Jeremy Leaman, *The Political Economy of West Germany, 1945 – 85*, (Basingstoke, the Macmillan Press Ltd., 1988), p 188
[82] Prof. Dr. Coing, 'Schlußberatung, Vermerk über die Ergebnisse des Besuchs der Begehungsgruppe bei der Universität Frankfurt am 15.1.1959', p 9, in BArch B 247/29

Fig. 3.1



Despite the government's best efforts, the proportion of *Abiturienten* opting for the more traditional disciplines at traditional universities as opposed to entering *Technische Hochschulen* never fell below 75 percent, giving rise to fears of a glut of humanities and social science graduates on the labour market.[83] Also clear from the table is the steady rise in total student numbers which affected all subject areas without exception. While the numbers in theology, law and medicine (not shown) at least doubled, particularly striking were the increasing numbers studying philosophy. This would seem to suggest that, in part at least, increased access to higher education for many people translated into the desire to study more traditional subjects and achieve social mobility along traditional graduate career paths such as the civil service rather than along other, more technologically inclined routes. A second reason, particularly for the increased numbers studying philosophy at the end of the 1960s and beginning of the 1970s, lay in the rise of the counter-culture movement and the burgeoning interest in different belief systems and alternative, usually radically left wing, forms of social organisation.[84]

Worse still, although the increase in enrolment in the traditional universities continued relentlessly, the trend appeared to be actually running backwards in the *Technische Hochschulen*, entirely defeating the objective of educating more engineers. Speculation as to the reason for this included an indictment of the way mathematics and the natural sciences were taught in the secondary schools resulting in *Abiturienten* being incapable of the demands of engineering disciplines. Another reason posited was the poor staffing

[83] Statistisches Bundesamt, *Wirtschaft und Statistik*, issue 1971, p 294
[84] See Dohms, 'Studentenbewegung und Überlieferungsvielfalt - das Beispiel Nordrhein-Westfalen', for a comprehensive discussion of this

ratios caused by the tendency of those gaining a *Habilitation* degree to go straight into industry where salaries and working conditions were more favourable. A further factor concerned the uncertain job prospects in engineering. In mining, for example, the annual need in the whole federal area was for around 50 mining engineers. Similarly affected were departments of metallurgy where increasing automation had resulted in the need for fewer metallurgical engineers.[85] To some extent, however, it is probable that the declining numbers in the *Technische Hochschulen* were also attributable to the rising popularity of the *Ingenieurschulen* (engineering colleges), the numbers of which had increased from 82 in 1958 to 109 in 1963 with an increase in student numbers from 39,995 to 52,472. Much of their attractiveness stemmed from the lower entry requirements and shorter time commitment because rather than offering a theoretical technical-scientific education, their training focused on the solving of problems of a practical nature in construction and production.[86] From the federal government's point of view, however, they did not produce engineers capable of producing research at the cutting edge of technology.

Ultimately, the solution adopted by many of the senates to the problem of falling numbers in the *Technische Hochschulen* was to open faculties of philosophy and medicine and to apply for recognition as a scholarly university and this pattern was followed in a number of *Technische Hochschulen* such as RWTH Aachen, Ulm, Dortmund, Ostwestfalen and Bremen despite very considerable and heated resistance from the *westdeutsche Rektorenkonferenz*.[87] (At the same time, some more traditional universities such as Erlangen-Nürnberg also started to incorporate technical faculties).[88] The expansion of the higher education system, then, appeared unlikely to succeed in addressing the issue of the technology gap between West Germany and the USA. Moreover, it was creating potential problems regarding the employability of large numbers of graduates educated only for employment in a shrinking traditional graduate employment sector. These points will be addressed in the following two sections.

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[85] 'Vermerk über die Ergebnisse des Besuchs der Begehungsgruppe bei der Technischen Hochschule Aachen', 22.11.65, pp 5 – 6 in BArch 247/29

[86] Statistisches Bundesamt, *Wirtschaft und Statistik*, issue 1964, pp 650 – 652

[87] For a discussion on this see 'Verfahren zur Begutachtung von Wissenschaftlichen Hochschulen', 88. Sitzung des Hochschulausschusses am 23. – 24. September 1965 in Bad Kreuznach, pp 39 – 40; Sitzung am 28.10.65, pp 26 – 28; letter From Herr Frey, Generalsekretär of the KMK Düsseldorf, early 1967 regarding the recognition of the new scientific Hochschulen, all in BArch B 304/1259/1

[88] Letter from Dr. J. Fischer (WRK) to Herrn Dr. Alois Kitzler, Verwaltungsdirektor der Universität Wien in August 1967, in BArch B 304/12592

Gaps in Technology: US/FRG Comparison

An exchange of correspondence between the Department of State and various embassies in Europe highlights the growing unease of all European governments regarding the technology gap.[89] The attitude of the US Department of State seemed to indicate that a number of factors were responsible for this:

> The technological gap exists primarily because European industrial enterprises have failed to organize themselves on an adequate scale of size and have not developed the practice of investing a sufficient proportion of their sales dollars in research[90]

Other issues identified included inefficient management, the size of European markets, the availability of venture capital, the mobility of technical manpower and ideas and the educational infrastructure,[91] as well as Europe's own fear of being unable to compete on the world market with the products of advanced technology, despite retaining technological superiority in a number of sectors.[92] Certainly, German enterprises were, on the whole, smaller than in the United States and thus were less able to sustain the financial burden of research and the time lag between product development and its commercial application.[93] Nevertheless, in the mid-1960s West Germany was committing a greater percentage of GNP to research and development than most OECD countries, the exceptions being the USA, France, the UK, the Netherlands and Sweden as the following table demonstrates:

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[89] See this in 'Scientific Matters: The Technology Gap', in *Foreign Relations of the United States, 1964 – 1968*, Volume XXXIV

[90] Telegram from the Department of State to Secretary of State Rusk in Belgium, Washington June 6, 1966, in 'Scientific Matters: The Technology Gap', p 3

[91] Memorandum by the President's Special Assistant for Science and Technology (Hornig), Washington, December 2, 1966, in 'Scientific Matters: The Technology Gap' p 11

[92] Circular Telegram from the Department of State to the Embassy in France, Washington, January 13, 1967 in 'Scientific Matters: The Technology Gap', p 14

[93] OECD, *Gaps in Technology*, p 158

Table 3.6

Global indicators of R&D efforts in industrialised OECD member countries 1963 - 1964

Country	GERD*	GERD per Capita	GERD/GNP at Market Prices	Qualified Scientists and Engineers engaged in R&D	
				Number	Per 10,000 population
	$US Millions[1]	$US Millions	%	Full-time Equivalent	Full-time Equivalent
United States	21,075	110,5	3.4	696,500	35.8
France	1,650	34.1	1.9	95,574	19.7
Germany	**1,436**	**24.6**	**1.4**	**105,010**	**18.0**
Italy	291	5.7	0.6	30,280	6.0
Japan	1,060	10.9	1.4	197,225	20.3
UK	2,160	39.8	2.3	159,538	29.4
Austria	23	3.2	0.3	3,220	4.5
Belgium	137	14.7	1.0	15,600	16.8
Canada	425	22.5	1.1	23,850	12.6
Netherlands	330	27.2	1.9	31,310	25.8
Norway	42	11.5	0.7	3,820	10.4
Sweden	257	33.5	1.5	16,530	21.6
Industrialised Western Europe[2]	6,326	24.3	1.6	460,882	18.3

*GERD: Gross National Expenditure on Research and Development
[1] at the 1970 exchange rate
[2] excluding international organisations

Source: OECD, *Gaps in Technology: Comparisons between Member Countries in Education, Research and Development, Technological Innovation and International Economic Exchanges*, (Paris, OECD, 1970), p 120

Moreover, more qualified scientists and engineers were engaged in research and development in West Germany than in any OECD country other than the USA, the UK and Japan.[94] Over the period 1958 –1964, public as opposed to private funding for research grew disproportionately in the USA accounting for 63.5 percent of total R&D funds by 1964 compared to West Germany's 41 percent.[95] However, the comparison is difficult in a number of respects. For instance, a substantial proportion of this difference is due to the extraordinarily large proportion of the US R&D budget devoted to the defence, space and nuclear sectors. This amounted to well over half of total R&D expenditure in the period 1963 – 1964 and accounted for all but 7.2 percent of government research funding. Only 16 percent of German public funding, in contrast, was spent on space, defence and nuclear

[94] OECD, *Gaps in Technology*, p 120
[95] OECD, *Gaps in Technology*, p 123

R&D. That said, however, of the results obtained from space, defence and nuclear research a proportion is generally available to the economy for industrial technology or exploitation in the commercial sense. This amounted to 51.2 percent in the USA, but only 13.5 percent in the FRG. Thus, it is possible to argue that that the FRG was benefiting far less from what was, in essence, radical or cutting edge technology. Nevertheless, the type of R&D generally considered as most specific to industrial activity and development tends to be financed by and performed within firms themselves. This research, largely taking the form of the incremental development of existing products or services, accounted for only 32 percent of total US R&D spending, but 56.5 percent in West Germany.[96] The implication of this, then, is that the FRG's strengths lay far more in incremental innovation to existing products, rather than in the discovery of groundbreaking new technology.

A second problem in interpreting the figures for publicly funded R&D arises from the very different organisation of the research effort in West Germany to that in the USA. This had developed from Allied attempts to divide up research expertise and disconnect it from direct government control after the war.[97] Basic research in Germany was the exclusive province of the *Hochschulen*, which were required to sustain a very broad research agenda, and the *Max Planck* institutes which were able to select priorities according to perceived scientific needs. Both received core funding from the *Länder* governments and public contracts, while the contribution of industry was tiny. They were also independent of either federal government or corporate funding.[98] A particular problem arose as a result of basic research being performed in the *Hochschulen*. The almost total research autonomy of the institutions and of the individual professors resulted in the greater part of the research in the *Hochschulen*, which was paid for with large sums of public money, not being made public. Thus, it was not only unavailable for general exploitation for the good of the economy; the system was inefficient in that it was liable to result in considerable fragmentation and duplication of effort throughout the country.[99]

'Paradigmatic' or strategic research on 'big science' projects of national or strategic importance was carried out in large laboratories, government research institutes and the 'Blue List' task-oriented and large-scale research institutes funded on a 50:50 basis by federal government and the *Länder*. Finally, applied research was the province of

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[96] OECD, *Gaps in Technology*, pp 128 – 130
[97] Hohn and Schimanck cited in Rebecca Harding and William E. Paterson, *The Future of the German Economy*, (Manchester, Manchester University Press, 2000), p 83
[98] Harding and Paterson, *The Future of the German Economy*, 2000), pp 85 – 86
[99] 'Kurzprotokoll über die 2. Sitzung des Unterausschusses zur Förderung der Forschung des Auschusses für Kulturpolitik des Deutschen Bundestages', 4.3.53, BArch B 304/312/1

technology transfer institutes, most particularly the *Fraunhofer* institutes. These were funded on a joint basis by the federal government and industry. They had developed considerable experience in the transfer of technology from the basic scientific research to the final application; however, their expertise was inevitably strongest in more traditional areas, with the result that these tended to be reinforced rather than new fields being developed. The result was a system with rigidly delineated areas of research and an inflexible and hierarchical funding structure which was slow to respond to rapidly changing technology. It proved to be a disincentive to entrepreneurial activity and did not favour groundbreaking new innovation, instead supporting incremental innovation based on existing technology. Hence, it has been convincingly argued that "the German economy has historically proven itself resilient to major shifts in techno-economic paradigms"[100] and that it "continues to make the best nineteenth-century products on earth".[101]

In terms of rates of innovation in research-intensive products, therefore, there is no doubt that the USA predominated in new product groups with rapid rates of technological change such as computers, semi-conductors and the manufacture of titanium and satellite communications as well as numerically controlled machine tools, specialised plastics and analytic and electronic-test instruments. In terms of older established product groups, however, such as machine tools, pharmaceuticals, and chemicals, Germany's economic performance remained strong. The same pattern repeated itself with performance indicators such as patent registrations and manufacturing licences, where Germany's manufacturing export performance was robust, particularly in chemicals and pharmaceuticals.[102] This was reflected in the comparatively large proportion of German industrial R&D expenditure devoted to the chemical industry (34.7 percent), which far outstripped that of the USA (13 percent). Abelshauser makes the point that in research-intensive industries, such as chemicals and pharmaceuticals, German firms had never lost their competitive edge. In contrast to the standardised mass production of the US, the cooperative production regime of this industry, based on diversified high-quality production and the customised production of prototypes and short production runs allied to a well-developed system of customer care, ensured its continuing strong presence internationally. He does, however, also point out that where the market permitted, the

[100] Harding and Paterson, *The Future of the German Economy*, pp 83 – 96
[101] Bruce Nussbaum, quoted in Gerd Junne, 'Competitiveness and the Impact of Change: Applications of "Higher Technologies', in Peter J. Katzenstein (ed.), *Industry and Politics in West Germany: Towards the Third Republic*, (Ithaca, Cornell University Press, 1989), p 249
[102] OECD, *Gaps in Technology*, pp 184 - 185

chemical industry in particular was well placed to achieve high output levels of quality goods because of its distinctive production regime which in some respects was more akin to the American production model than much of German industry.[103] West Germany also committed relatively more (31.2 percent of) industrial R&D to the research-intensive electronics industry than all other western industrialised countries, although its performance in this area was considerably less strong.[104] That said, however, the FRG did prove adept at adopting high level technology from other countries and incorporating it in the sectors and products in which it had a comparative advantage, once again following the pattern of incremental, rather than radical innovation.[105]

Graduate Employability

OECD figures demonstrated that the percentage of graduates among professional workers in the USA was 53.2 percent compared to 41.1 percent in Germany. Conversely, the proportion of graduates amongst scientific and technical personnel was approximately the same in both countries (USA 54.5 percent, Germany 54.3 percent). However, the OECD makes the point that a large "reservoir" of German engineering graduates ended up in the services sector as opposed to being deployed elsewhere in the manufacturing industry[106] as happened in the USA. Moreover, a substantially higher proportion of German graduates of all hues went into public administration, (the traditional employment for German graduates along with law, the church, the civil service and medicine), compared with the USA, where more graduates became managers in private industry (ca. twelve percent) as opposed to ca. ten percent in Germany.[107]

There are three points to be made here. The first is that the evidence presented by the OECD does not indicate that all US graduates were employed in graduate-level jobs; Germany was unlikely to have been alone in producing more graduates than there was suitable employment for. However, Ben David argues that the easier absorption of US graduates into the workforce was largely due to the more open organisation of the universities and the development of curricula which adapted more flexibly to the changing

[103] Werner Abelshauser, 'Das Produktionsregime der Chemische Industrie im Sozialproduktionssystem der deutschen Wirtschaft des 20. Jahrhunderts' in Petri Rolf, (ed.), *Technologietransfer aus der deutschen Chemieindustrie (1925-1960)*, (Berlin: Duncker & Humblot, 2004), p 53
[104] OECD, *Gaps in Technology*, p 136
[105] Junne, 'Competitiveness and the Impact of Change', pp 249 – 255
[106] OECD, *Gaps in Technology*, p 22
[107] OECD, *Gaps in Technology*, pp 25 – 28

demands of business and industry as well as to the challenges posed by scientific and technological advance. In contrast, both the organisation of German higher education and the curricula owed much to a system dating from before World War One.[108] The second is that, if the contention that more highly qualified individuals make a disproportionate contribution to output is accepted, the greater participation of US graduates in private industry and manufacturing may well have had a positive impact on productivity and growth (though not necessarily on the advance of technology). Employment in public administration, the traditional destination of German graduates,[109] offered less opportunity to influence these directly. The third relates to the fact that despite the West German federal government's drive to increase the number of highly qualified engineers in the economy to address the gaps in technology, a significant proportion of those graduating in engineering were not employed in it. The question, therefore, is whether there were suitable employment opportunities for the engineering graduates and if so, why so many chose to pursue their careers in other avenues? It also raises questions as to whether the teaching in the engineering faculties was sufficiently oriented to modern industrial practice and the changing patterns of industry. Certainly, organisations such as the *Deutscher Verband Technisch-Wissenschaftlicher Vereine* (German Association of Technological and Scientific organisations) were extremely critical of the lack of a future-oriented dynamic in the higher education system.[110] Other luminaries, such as Friedrich Edding, recommended the wholesale root and branch reform of the entire education system including a different distribution of research, intellectual scientific activity and training for higher-level employment between university and non-university establishments.[111]

For their part, the *Hochschulen* remained adamant in asserting that only the continuation and reinforcement of the "fundamental legal guarantee of the freedom of research and teaching" and the autonomy of the universities could address the problem.[112] There was recognition that some changes were necessary, although most of their favoured measures simply focused on limiting entry to higher education. The *westdeutsche Rektorenkonferenz*, for example, advocated the more intensive use of numerus clausus; that university entrance examinations should be more generally applied; that new forms of further education offering higher-level qualifications be developed; and that *Gymnasien*

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[108] Joseph Ben David, *OECD Fundamental Research and the Universities: Some Comments on International Differences*, (Paris, OECD, 1968), p 38
[109] OECD, *Gaps in Technology*, p 45
[110] Deutscher Verband Technisch-Wissenschaftlicher Vereine, 'Staatspolitische Aufgaben im Bereich naturwissenschatlich-technischer Bildung', 5.7.68, pp 1 – 5, in BArch B 251/1276
[111] Friedrich Edding, 'Die Hochschulen im Wachsen der Wirtschaft', January 1967, in BArch B 251/1276
[112] 'Godesberger Rektoren-Erklärung zur Hochschulreform', 6.1.68, in BArch B 251/1277

should not automatically steer their successful *Abiturienten* towards university.[113] At the end of the 1960s, the *Kultusminster Konferenz* drew up a number of action plans to address the problems of institutional overcrowding and guidance on course choice including the development of new forms of higher-level education, the year-round utilisation of existing facilities, the removal of some of the administrative burden from teaching staff, the creation of rigorous student counselling/advice services, the closer observance of the minimum duration of courses of study, and the reinforcement of distance learning opportunities. However, as a later report of its *Unterausschuss für quantitative Berechnung* (sub-committee for quantitative calculation) in 1975 indicated, action on the plans had been patchy at best and was frequently non-existent.[114] In the case of the *Länder* governments, the motive was possibly as much financial as political. In the case of the *Hochschulen*, however, given that a frequent response was that action was considered unnecessary, it is hard to escape the impression that the protection of tradition and of professorial and institutional autonomy was the primary guiding force.

In any case, the main problem was one of graduate underemployment rather than unemployment because there was very little overt unemployment in West Germany over this period. 1963 had witnessed the beginning of a new export-led upswing in the economy resulting in an increase of the growth rate in real GDP in 1964 from 2.8 percent to 6.7 percent, which it has been suggested, was largely due to the influx of unskilled and lower skilled *Gastarbeiter* (immigrant labour) from Southern Europe and Turkey from 1960 onwards. By 1970, *Gastarbeiter* would comprise 10.8% of the workforce and of these, around 80 percent (1.4 million) were involved in the manufacturing and construction sectors, allowing these to continue to grow in contrast to the experience of most highly industrialised countries.[115] Inflation in West Germany, however, began to rise dramatically partly as a result of powerful inflationary pressures from abroad imported via the exchange system. There was a fall in the growth of output and a sharp fall in investment from 1964 to 1965 of almost 50 percent with further falls to come, which eventually led to recession in the years 1966 - 67. Nevertheless, with the sole exception of 1967 (when as Leaman points out, only the removal, voluntarily or otherwise, of thousands of women and around 300,000 migrant workers from the labour market kept the unemployment figure at less than

[113] 'Zulassungsbeschränkungen an den wissenschaftlichen Hochschulen', Entschließung der LX. Westdeutschen Rektorenkonferenz, 27.3.68, in BArch B 251/1277
[114] 'Stand der Maßnahmen nach Länderangaben (Ziffern entsprechen dem 4. Rahmenplan) in Tischvorlage zur Sitzung der Arbeitsgruppe Kapazitätsfragen am 1.7.75', pp 3 – 16 in BArch B 304/858
[115] Herbert Giersch, Karl-Heinz Pacqué and Holger Schmieding, *The Fading Miracle: Four decades of market economy in Germany*, (Cambridge, CUP, 1992), 133 - 135

one million[116]), for twelve out of the fourteen years between1960 and 1973, the unemployment rate ran at less than 1.5 percent, and for nine of those, at less than one percent. Moreover, the level of vacancies consistently surpassed the level of registered unemployed despite the surge in the indigenous birth rate and the arrival of the *Gastbarbeiter*.[117]

The late 1960s appeared to signal a definite change in the attitude of the federal government to the role of human capital development with respect to the idea of planning higher education to conform to labour market demand. In 1965 the OECD published a report which described as "rather disquieting"[118] the fact that up until 1965 no comprehensive study had been made of the employment prospects for graduates, so that educational planning was based solely on demographic projections which took no account of likely or desirable economic or technological development. Partly in response to this, but mainly to increasing concern over rising student numbers, cost and graduate employability, several manpower demand studies were commissioned over a number of years,[119] and a meeting of international 'experts' on the subject arranged in May 1969 to share experiences in this area. The latter included academics from the London School of Economics, Ghent, The Hague, Stockholm, Vienna, Oslo and Paris, and representatives from the OECD and L'Institut National d'Études Démographiques.[120] An earlier meeting of German academics in January 1969 to discuss the same subject, however, had resulted in a wholly negative reaction to the idea of manpower planning and the tailoring of higher education to suit, highlighting the difficulties inherent in trying to reconcile the views of differing factions in policy-making for higher education.[121] This reaction ultimately appeared justified in one respect at least, as all the manpower demand studies demonstrated significant discrepancies, most notably in their respective estimates for graduates required

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[116] Leaman, *The Political Economy of West Germany 1945 – 85*, p 175

[117] Secretariat of the Economic Commission for Europe, 'The European Economy in 1965', in *United Nations Economic Survey of Europe*, chpt. 2, pp 1 – 18; for an analysis of the causes of the 1966/67 recession see Leaman, *The Political Economy of West Germany 1945 – 85*, pp 172 – 175

[118] OECD, *Gaps in Technology*, p 45

[119] Of these, the three most prominently referred to in the primary sources were Hajo Riese, *Die Entwicklung des Bedarfs an Hochschulabsolventen in der Bundesrepublik Deutschland*, unter Mitarbeit von Thomals Kempf, Alexander Krafft und Helmut Schweikert, Wiesbaden 1967; Hans Peter Widmaier, 'Bildung und Wirtschaftswachstum, Modellstudie zur Bildungsplanung', unter Mitarbeit von B. Frey, M. Altwegg, A. Krafft und P. Lardi, in *Bildung in neuer Sicht*, Schriftenreihe des Kultusministeriums Baden-Württemberg zur Bildungsforschung, Bildungsplanung, Bildungspolitik, Vol. A, No. 3, July 1967; L. Alex et al., 'Angebot und Bedarf an hochqualifizierten Arbeitskräften in der Bundesrepublik Deutschland bis 1980 – Arbeitskräftebilanz und Intensivanalyse', 1972

[120] Letter (in English) written by Dr Heim, 24.4.69 BArch B 247/24; see also 'Introductory remarks to the Meeting of Experts for the forecasting of manpower requirements at Köln on May 28 1969', in BArch B 247/24

[121] Brinkmann, in 'Protokoll des Expertengespräches über Fragen der Bedarfsberechnungen' 17.1.69 in BArch B 247/24

in the cultural sciences, medicine and engineering sciences. Despite this, there was consensus among them that by 1980/81 that there would be a need for at least double the 1961 figure for graduates in the workforce in order to keep pace with the federal government's economic priorities and the pace of technological change and thus strong grounds existed for investing in a further expansion of the system.

Federal regulation to enforce the restructuring of entry to *Hochschulen* would, in any case, have been impossible to implement due to *Länder* sovereignty over education. The reform ethos of the 1960s, economic developments and the creation of a 'Grand Coalition' of the major political parties at federal level from 1966 to 1969 had persuaded the *Länder* to accept a substantial degree of federal guidance, participate in the creation of institutions for the joint planning of education, research financing and university construction, and develop federal framework legislation for higher education. However, the end of the 'Grand Coalition' and the coming to power of the SPD in 1969 led to serious political differences regarding education planning between the federal government and a number of the *Länder,* as well as between some of the *Länder* themselves. From then on, legislation on higher education became a political battlefield where the different political parties fought out their ideological differences with regard to university reform. The only new institution to survive the process was that concerning the joint financing of research.[122] The more egalitarian approach of the SPD led to the virtual across-the-board rescinding of entry restrictions and the consequent opening up of higher education to the masses set the scene for a spectacular explosion in student numbers in the early 1970s. While this may well have resonated with one of the tenets of human capital development theory – that increasing the general educational level of a population leads to enhanced economic growth – it also created even more severe logistical problems with regard to accommodation, financing and maintaining the quality of the education provided, as well as the employment prospects for increasing numbers of graduates over the next two decades.

Conclusion

Following the end of WWII there was an obvious need for the restoration of the institutions of higher education and the resumption of teaching and research. The long

[122] Scharpf 'No Exit from the Joint-Decision Trap?', p 5

years of the Weimar Republic, National Socialism and war had left German science and technology much behind that of the rest of Europe and the USA especially in more modern and interdisciplinary fields such as biotechnology. However, while one academic stated that "The once flourishing German physics had been forced down to a parochial level",[123] the same was not necessarily true of more traditional areas such as chemicals and pharmaceuticals where German expertise still flourished.

Reconstruction and the initial expansion of the sector along traditional lines was, on the whole, generally welcomed. However, the rapidly expanding post-war population and the changing structure of the West German economy highlighted not only the social inequity of the existing system, but its increasing inability to provide sufficient numbers of the type of highly educated graduates demanded in an increasingly technological age. Demand for professional training, which had never previously been seen as the remit of universities, was seen as threatening the tradition of the unity of research and teaching and incurred the active resistance of academia. However, reform of pre-university education and changing social attitudes reinforced the idea that higher education was the right of everyone who wanted and was capable of it. More people demanded the chance of social mobility and a more lucrative career, while the country's increasing prosperity meant that more families had the private income to support their offspring through higher education and state funding was available for those who did not.

Perhaps the greatest pressure for expansion and reform of the system came in the form of the perceived gaps in technology which existed between Germany and the United States. While, to some extent, this was attributable to the demands of post-war recovery, the USA also cited the institutional features of European capitalism, insufficient investment in research and development and the educational infrastructure as causes. The USA invested far more in its education system at all levels both absolutely and relatively. Proportionately more of its young people entered higher education, graduated successfully and promptly from it and appeared to be absorbed more effectively into the economy. Any gaps in the US provision, especially for engineers, appeared to be filled by 'brain drains' from other countries, including West Germany. This had serious implications for German industry and technology, particularly after the building of the Berlin Wall which closed off a major source of engineering expertise entering the West, and also for academia where a shortage of doctoral graduates posed serious problems with regard to staffing in the *Hochschulen* and consequently to the quality of teaching and research.

[123] Becke, Letter to the Geschäftsstelle des Wissenschaftsrates, 21.7.71, in BArch B 247/30

Reform was more difficult because of the extremely cumbersome and multi-layered joint-decision-making process resulting from *Länder* autonomy in education. While a number of reforms to the higher education system were enacted throughout the late 1960s in particular, aided by the existence of a 'Grand Coalition' of political parties in the federal government, the ending of the latter and the accession to power of the SPD led to serious ideological differences in the approach to higher education and the overturning of much of the institutional reform which had been achieved. Moreover, the more egalitarian approach to higher education introduced by the SPD government enabled a huge expansion of the sector in the ensuing decades.

In the next chapter we turn to East Germany to explore the development of higher education in a socialist society with its very different interpretation of the function of the sector with respect to society and the economy.

Chapter 4

Reform and Expansion of East German Higher Education 1945 – 1971

After the conclusion of WWII, the reestablishment of a fully functioning system of higher education and its attendant research facilities in the Soviet Zone was a high priority for the Communist Party for a number of reasons. The damage caused to academia by the Nationalist Socialists in terms of expulsions, structural change within the system, academic priorities and international scientific isolation had been compounded by the loss of senior scientific and technical personnel to the war and to the United States and the Soviet Union in the form of intellectual reparations[1] and had exacerbated the gaps in technology which had appeared between Germany and the United States. Unlike the other Allied Zones, however, the Soviet Zone was also subject to punishing levels of physical reparations demanded from it by the Soviet Union. Moreover, the region needed to establish itself as a fully-functioning national entity with a very different vision of democratic legitimacy from that of the West.

Changes in the perception of the role of science and technology with the consequent reorganisation of higher education and research systems were common in all industrialised countries; however, in Eastern Germany the training of new cohorts of scientists and technologists was critical in order to create the modernising force necessary to achieve this within the parameters of a Marxist-Leninist dialectic orientation. Lenin had stated that knowledge of the laws of natural science was essential in order to understand modern technology and, in turn, science itself could only be understood fully when applied in the form of technology. He deemed it essential "that science genuinely enter [our] flesh and blood, that it be transformed into a component of [our] lives, fully and genuinely".[2] Hence, the management and regulation of science became increasingly politically important in the pursuit of technological and economic growth. However, it appeared that in socialist societies the solution of economic problems always remained subject to the overarching political aims of that society. For instance, as one East German politician

[1] Raymond G. Stokes, *Constructing Socialism: Technology and Change in East Germany 1945 – 1990*, (Baltimore, John Hopkins University Press, 2000), pp 36 – 37
[2] Vladimir Ilyich Lenin, cited in Margrete Siebert Klein, *The Challenge of Communist Education*, (New York, Columbia University Press, 1980), p 54

stated, "economic activity can be nothing but the realisation of political aims. It can never have a purpose in itself".[3]

The first two major reforms of higher education in the late 1940s and early 1950s can arguably be regarded as the "political socialisation"[4] of higher education and its participants. The third reform of the late 1960s demonstrated the increasing economisation of technical and professional training in higher education,[5] acknowledging the role of science as a force of production and the innovative force behind the economy. Moreover, it also had the effect of establishing complete central control and thus finally removing the last vestiges of the traditional German higher education system. The purpose of this chapter is to explore the reasons for, aims of, and methods employed to achieve the reforms and the effects of the reforms on the East German higher education system. I will also reflect on their effectiveness in terms of achieving the economic aims of the government until 1971 when the leadership and ethos of the regime changed.

First Higher Education Reform

Denazification

The two key processes which affected the higher education system of the Soviet zone of occupation were denazification and democratisation. In the first, or "anti-fascist, democratic higher education reform",[6] denazification was seen as the crucial element in the elimination of fascist influence in the institutions, curricula and student body in the "irreconcilable warfare against all bourgeois ideologies, bourgeois objectivism and cosmopolitanism[7]…in all universities and *Hochschulen*".[8] Initially, the universities

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[3] Heinz Puder cited in Horst Betz, 'East Germany: The Primacy of Dogma over Reform', *Journal of Economic Issues*, Vol. VIII, No. 1, 1974, p 88

[4] Thomas H. Baylis, *The Technical Intelligentsia and the East German Elite: Legitimacy and Social Change in Mature Communism*, (Berkeley, University of California Press, 1974), p 36

[5] For a discussion on this see Eckart Förtsch, 'Science, Higher education and Technology Policy', in Kristie Macrakis and Dieter Hoffman (eds), *Science under Socialism: East Germany in Comparative Perspective*, (Cambridge Mass., Harvard University Press, 1999), chapter 1, and Baylis, *The Technical Intelligentsia*, pp 36 - 38

[6] 'Durchführung der Hochschulreform der DDR', Sektor Hoch-und Fachschulpolitik des Instituts für Marxismus-Leninismus, p 3, SAPMO DY 30/IV A 2/9.04/511

[7] A codeword used to suggest ties to an international Jewish conspiracy – see Paul Josephson, 'Stalinism and Science: Physics and Philosophical Disputes in the USSR, 1930 – 1955', in Michael David-Fox and Györgi Péteri (eds), *Academia in Upheaval: Origins, Transfers, and Transformations of the Communist Academic Regime in Russia and East Central Europe*, (Westport CT, Bergin & Garvey, 2000), p 112

[8] George P. Schmidt, 'The University Student in Germany', *The Journal of Higher Education*, 24, (2), 1953, p 67

themselves were left to carry this out. However, the reluctance of the professoriate to admit that any more than a very few of their number were true believers in National Socialism, coupled with the desire of the overwhelming majority of the professoriate to return to the 'German University Tradition' resulted in more radical intervention on the part of the Soviet authorities. For instance, the Senate of the University of Greifswald expelled 78 of their number, leaving 84 in post. Of those remaining, however, 55 had been members of the NSDAP, which prompted the complete closure of the university by the Soviets for a time and the appointment of a more malleable rector. Some other universities, such as that of Leipzig, were extremely reluctant to pursue denazification because of the large numbers of teaching staff who had already been removed by the Americans on leaving the now Soviet zone and by the Soviets themselves to boost their own research efforts. Nevertheless, by the end of 1945, of the 252 professors at Leipzig at the end of the war only 49 remained. The medical and natural science faculties were particularly badly hit with only 9 left out of 83 and 7 from 57 respectively. By 1947, of the 1,633 professors, professors emeriti and docents working in the Soviet zone of occupation in 1944, only 17.5% remained.[9]

Connelly argues that this level of denazification was sufficient to create a complete break with the previous system and create within academia a strong affinity with the aims of the new regime.[10] However, such was the deficit of experienced teaching staff following denazification that from 1948 the authorities were forced to reinstate a considerable number of those expelled whom they considered to have been less active National Socialists. Consequently, by 1954 around 28 percent of professors and docents consisted of former NSDAP members, mainly in the technical sciences (41.9 percent), medicine (45.9 percent) and the natural sciences (31.2 percent). Interestingly, however, the SED (*Sozialistische Einheitspartei Deutschlands* or German Social Unity Party) adopted much of the same rhetoric with regard to the contribution of scientists to the Nazi regime as did the professoriate in West Germany. An emphasis on the "higher morality" of those employed in the practice of selfless and disinterested scientific research not only permitted the SED to ignore a scientist's previous attachment to the National Socialists, but allowed it to maintain the stance that science was "essentially humane and progressive". Moreover, the SED's stance with regard to science largely echoed what the existing professoriate thought of itself and thus was a means of encouraging it towards acceptance of the new

[9] John Connelly, *Captive University: the Sovietization of East German, Czech and Polish Higher Education 1945 – 1956*, (Chapel Hill and London, The University of North Carolina Press, 2000), pp 96 – 98
[10] Connelly, *Captive University*, pp 132 – 136

regime.[11] The reinstatement figure was much lower in philosophy and the social sciences (*Gesellschaftswissenschaften*), however, which were considered to be the wellsprings of the new socialist proletarian elite of the future and were thus much more politically sensitive.[12]

There is, therefore, a strong case to be made that within the professoriate at least some measure of the traditional university system persisted. The scarcity of academic talent, along with strong competition from the West for what there was, combined to ensure that the authorities could not be too rigorous in their attempts to destroy the existing system, or the elite institutional structure which ran it, at least initially.[13] Certainly the first education bill strongly emphasised the promotion of independent scientific thought and academic freedom in higher education,[14] while frequent reference was made to the mastery of the rational principles of mathematics and the natural sciences as fundamental to the resolution of the problems of society and the economy. Moreover, SED Party membership remained very low among scientists and mathematicians until the late 1950s (when the SED became more aggressive in its drive to promote the ideological integration of the scientists and technical intelligentsia). For instance, only five out of 36 mathematics professors had joined by 1958, in contrast to around 90 percent of historians and even higher figures for economists and legal scholars.[15] However, the government also appointed a considerable number of new professors following denazification, most of whom had no prior academic experience, two-thirds lacking the customary *Habilitation* degree necessary for teaching and many lacking even a doctoral degree. Their attraction for the authorities was both Party loyalty and their background in industry, as considerable pressure was placed on the academic sector even in the early stages to work in close collaboration with local industry in order to supply graduates suitably trained to work in specific milieu and to develop the

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[11] Reinhard Siegmund-Schultze, 'The Shadow of National Socialism', in Macrakis and Hoffmann (eds), *Science under Socialism*, p 70; Mitchell G. Ash, 'Kurt Gottschaldt and Psychological Research', in Macrakis and Hoffmann (eds), *Science under Socialism*, p 299 argues that there was considerable respect for 'objective' scientific knowledge in the early days of the regime and for the prestige and image of modernity that went with it as well as for its potential applications for the good of the country

[12] Mitchell G. Ash, 'Scientific Changes in Germany 1933,1945, 1990: Towards a Comparison', *Minerva*, Vol. 37, 1999, pp 334 - 335

[13] Norman M. Naimark, *The Russians in Germany*, (Cambridge, Mass., Belknap Press, 1995), chapter 8 for the period 1945 - 49; see also Ralph Jessen, *Akademische Elite und Kommunistische Diktatur: die ostdeutsche Hochschullehrerschaft in der Ulbricht-Ära*, (Göttingen, Vandenhoeck und Ruprecht, 1999), pp 119 - 129**;** Dolores Augustine, *Red Prometheus: Engineering and Dictatorship in East Germany, 1945 – 1990*, (Cambridge Mass., MIT Press, 2007), pp 51 – 60

[14] Siegfried Baske, 'Die Konzeptionen der Hochschulpolitik und Hochschulgestaltung in der DDR und in der Volksrepublik Polen', in Oskar Anweiler and Friedrich Kuebart (eds), *Bildungssysteme in Osteuropa – Reform oder Krise?*, (Berlin, Berlin Verlag, 1983), pp 285 – 286

[15] Siegmund-Schultze, 'The Shadow of National Socialism', pp 71 – 72; Connelly, *Captive University*, p 145

type of innovation which would lead to increased productivity.[16] For this new breed of professor, therefore, higher education and research were tools of economic development in the service of the nascent nation; however, their lack of academic experience can only be assumed to have contributed to a lowering of the standard of teaching in the *Hochschulen* which was already compromised by low teacher numbers.

The process of denazification and the removal of bourgeois influence also included the content of university courses. State and academic libraries were purged of all literature which might be considered anti-Soviet or anti-Communist. In some subjects, the new course content was translated directly from its Russian counterpart; in others, such as history and philosophy, study plans were completely re-designed with the emphasis on Marxism-Leninism. In practice, however, the insufficient numbers of Russian translators and the considerable lack of interest in the matter displayed by Soviet officials resulted in confusion among East German educators, a shortage of teaching materials and resources and a less than unified approach to higher education in the region.[17]

Democratisation

Equally as important as denazification was the creation of a new, socialist intelligentsia from the worker/peasant class whose loyalty would be bought as a result of upward social mobility,[18] because "no ruling class has ever survived without its own technicians".[19] Indeed, as early as 1944, the *Kommunistische Partei Deutschlands* (KPD) had begun considering how to change the system in order to eliminate "fascist and imperialist influences" and remove the educational privileges enjoyed by the bourgeoisie in the previous rigidly class-based and elitist German structure.[20] The goal, therefore, was to engineer a substantial increase in the proportion of children from working class families undertaking university-level education. Because the working classes made up roughly 60 – 70 percent of the population, this figure was to be reflected in the university population and a target of 60 percent was set.[21] Given the lower qualification level of most of these candidates, special worker preparatory institutes (*Vorstudienanstalten*) providing preparation courses for university were established, which were ultimately incorporated

[16] Augustine, *Red Prometheus*, p 58; see also Raymond Bentley, *Research and Development in the Former German Democratic Republic*, (Boulder, Westview Press, 1992), p 92
[17] Connelly, *Captive University*, pp 96 – 98
[18] Connelly, *Captive University*, p 3; also Baylis, *The Technical Intelligentsia*, p 48 amongst others
[19] Joseph Stalin, cited in Baylis, *The Technical Intelligentsia*, p 35
[20] Margrete Siebert-Klein, *The Challenge of Communist Education*, pp 6 – 8
[21] Baylis, *The Technical Intelligentsia*, p 47

into the universities as 'Worker-Peasant' faculties (*Arbeiter-Bauern Fakultäten* or ABF). The policy was backed up by the preferential allocation of scholarship funds for the worker-peasant students.

Ideological enthusiasm, or at least political reliability, was the other major criterion for entry to *Hochschulen*; therefore, any candidate who had in any way served the Nazi party (by serving in the army, for instance) was obviously barred from higher education. Trade unions, the 'democratic' parties and various youth and women's committees referred candidates to the ABF. All applicants were subject to rigorous checks regarding both background and their "antifascist democratic convictions", with the easiest 'proof' of political reliability being membership of the increasingly strong SED. Hence, in the winter semester of 1946/47 almost 52 percent of the student body at Leipzig University were members. Other 'suitable' organisations included trade unions and the *Freie Deutsche Jugend* (FDJ)[22], membership of which subsequently became virtually mandatory for university admission. Membership was encouraged in part because extra pressure could be put on the students via the various organisations to conform and work harder.[23] Moreover, the checks concerned not only the candidates' activities and political affiliations but those of their parents, thus also providing an effective instrument of control over that generation.

The make-up of the student population, therefore, changed significantly in a relatively short space of time. Despite considerable initial difficulties in finding sufficient numbers of workers/peasants who were willing to give up an early entry into paid employment, by the mid-1950s the number of students at university of ostensible working-class origin had reached 53 percent. This figure was much greater than in any of the other new Eastern Bloc countries and considerably greater than that of West Germany at four percent.[24] Political reliability, however, was no guarantor of academic ability or technical expertise. Ultimately, the policy of preferment for working-class students was to be dropped in the early 1960s and the worker and peasant faculties discontinued (except for two token institutions at Halle and Freiberg). This was, in part, because rigid ideology was at that point giving way to a more pragmatic approach to the economy in the form of Ulbricht's New Economic System (NES), which will be discussed later. Hence, because of the less

[22] The FDJ was the official socialist youth movement of the SED and the GDR. Membership comprised both males and females between the ages of 14 and 25 and though ostensibly voluntary, those who did not join found a great many difficulties put in their way especially in terms of university entrance and job selection
[23] Connelly, *Captive University*, pp 226 – 231
[24] Kurt Sontheimer and Wilhelm Bleek, *Die DDR: Politik, Gesellschaft, Wirtschaft*, (Hamburg, Hoffman und Campe Verlag, 1972), pp 177 – 178. Exact figures vary depending on the source consulted

than satisfactory performance of many ABF students and graduates, academic merit again replaced background as the arbiter of university entrance for a time, thus effectively permitting the re-emergence of a middle-class elite.[25]

The Primacy of Science and Technology

Given the ideological focus on the interdependence of science and technology and that the main function of higher education was seen as serving the needs and goals of the economy, there was considerable extra emphasis laid on these and related disciplines such as mathematics and economics at the expense of the humanities, particularly in the worker/peasant faculties. The function of academic basic research (except for that into classical engineering) was largely removed from the *Hochschulen* and placed in the remit of the elite Academy of Sciences *(Akademie der Wissenschaften)* which became the largest research institution in the country, performing the functions of the *Max Planck Gesellschaften* and the *Fraunhofer Gesellschaften* in the West. There were a number of consequences of this. One was that a considerable amount of state funding which would otherwise have gone to the *Hochschulen* was diverted to the Academy; another stemmed from the allocation to the Academy of the right, previously reserved for *Hochschulen*, to supervise doctorates and *Habilitations*, which had an impact on the number and quality of doctoral students choosing to remain in the *Hochschulen* after taking their first degree;[26] a third was the loss of a significant degree of scholarship from the *Hochschulen* because the research projects remaining there consisted largely of applied research geared towards the "socialist reconstruction" of East German industry,[27] particularly in the leading branches of the economy (defined in 1949 as metallurgy, light technology, electrotechnology, synthetic fibres, plastics, the utilisation of coal, construction, agriculture and the increase of food reserves). All *Hochschulen* were obliged to commit a substantial proportion of their research capacity to these areas. Apart from the direct benefits to industry derived from these projects, a secondary aim was that all graduates would be able to carry over the most modern scientific and technical knowledge into production and social practice.[28]

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[25] Geoffrey J. Giles, 'The Structure of Higher Education in the German Democratic Republic', in *Higher Education*, Vol.7, No.2, May 1978, p 147; see also Baylis, *Technical Intelligentsia*, pp 48 – 49; for a different view of the prowess of the worker/peasant graduates see Connelly, *Captive University*, pp 246 – 247
[26] Bentley, *Research and Technology in the Former German Democratic Republic*, pp 80 – 82
[27] See for example Connelly, *Captive University*, pp 60 – 62; Baylis, *The Technical Intelligentsia*, pp 36 - 39
[28] *Protokoll der 1. Parteikonferenz der Sozialistischen Einheitspartei Deutschlands*, (Berlin, Dietz Verlag, 1949), p 537

Quite apart from the tenets of Marxist-Leninist ideology, there were three very practical reasons for prioritising science and technology. Firstly, there was an urgent need to compensate for deficiencies in raw material resources. Apart from the obvious destruction of around 15 percent of productive capacity as a result of war damage and the loss of a further 26 percent of capital assets in the form of Soviet reparations, the division of the country agreed at Potsdam had separated Eastern Germany from virtually all its traditional sources of raw materials and semi-manufactures for its more advanced industrial processes, confining it to an area which had previously produced only five percent of the Reich's total production of iron ore and 2.3 percent of the hard coal which had formed the basis for so much of the Reich's manufactures.[29] Thus, research into processes for product substitution was crucial; for instance, a critical shortage of building timber resulted in the design and development of terraced concrete apartment blocks. The sourcing and synthesis of reliable fuel/energy sources was also vital.[30] Secondly, scientific advance was seen as the means of helping to increase worker productivity levels; the first five-year plan required an increase of 60 percent in these by 1955 accompanied by a simultaneous reduction in costs of at least 23 percent.[31]

The third was the attempt to establish self-sufficiency in scientific and technological research in line with Stalinist principles.[32] In part, at least, this was in order to confer legitimacy and status on the GDR and demonstrate the efficiency and superiority of the socialist system over that of the West; although a second interpretation is that autarchy would preclude any danger of economic and technological reliance on the West which might prejudice its identity as a separate nation.[33] The process, however, was not successful. The example of the chemical industry is illustrative. During the decade 1945 – 1955 the chemical industry in the GDR fell far behind that of West Germany. Although some of this was attributable to the wholesale "industrial disarmament" undertaken by the Soviet occupying authorities immediately after the war, historians argue that the sudden radical disruption of trading partners and the need to restrict imports from the West, along with the weaknesses inherent in a centrally planned economy (which will be discussed in

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[29] Mike Dennis, *German Democratic Republic: Politics, Economics and Society*, (London, Pinter Publishers, 1988), p 129

[30] *Protokoll des 111. Parteitages der Sozialistischen Einheitspartei Deutschlands*, (Berlin, Dietz Verlag, 1951), p 380, 397

[31] *Protokoll des 111. Parteitages der Sozialistischen Einheitspartei Deutschlands*, pp 382 - 383

[32] Paul Josephson, 'Stalinism and Science: Physics and Philosophical Disputes in the USSR, 1930 – 1955', p 115. He argues that scientific autarchy had been a feature of Stalinism for decades, to the point where regular scientific contact with the West had all but ceased.

[33] Gary L. Geipel, 'Politics and Computers in the Honecker Era', in Macrakis and Hoffman (eds), *Science under Socialism*, pp 235 – 238; see also André Steiner, *Von Plan zu Plan: Eine Wirtschaftsgeschichte der DDR*, (München, Deutsche Verlags-Anstalt, 2004), p 115

more depth later) were equally responsible. Moreover, the East continued to fall further behind the West even after the sanctioning in 1958 of a special programme designed to double chemical production within seven years and promote even greater production of synthetic materials and plastics. The decline of the industry was, however, partly attributable to the failure of other socialist countries and the Soviet Union in particular to deliver less than half of promised raw material imports from 1959 – 1961.[34] This latter was also a contributory factor to the slow development of other manufacturing industries resulting in the non-fulfilment of Plan targets and a perceptible worsening of product choice and living conditions for the populace.[35]

Second Higher Education Reform

A fuller implementation of Soviet pedagogy was addressed through the "socialist revolution of higher education" in the second or "democratic" higher education reform which took place from 1951 – 1952,[36] and was declared by the politicians responsible to be the logical further development of and fulfilment of the German humanistic tradition of higher education in that "Humboldt's ideas and deeds belong absolutely to the humanistic traditions of the socialist university and socialist system of education".[37] In part this reform was intended to rectify what was seen as the tendency of GDR academics to continue to look to the West for intellectual leadership. Additionally, despite the fact that all the education ministries were staffed by members of the SED, they were accused of being too cautious in their application of Marxist-Leninist principles to pedagogical problems. The reform measures were also regarded as the means of training the future generation of East German socialists and further 'technicalising' higher education in the service of the state.[38]

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[34] Rainer Karlsch, 'Capacity Losses, Reconstruction and Unfinished Modernization: The Chemical Industry in the soviet Zone of Occupation (SBZ)/GDR 1945 - 1965', in John E. Lesch (ed.), *The German Chemical Industry in the Twentieth Century*, (Dordrecht, London, Kluwer Academic Publications, 2000)
[35] Steiner, *Von Plan zu Plan*, pp 118 – 119
[36] 'Durchführung der Hochschulreform der DDR', Sektor Hoch-und Fachschulpolitik des Instituts für Marxismus-Leninismus, p 3, SAPMO DY 30/IV A 2/9.04/511
[37] Otto Rühle quoted in Horst Siebert, 'Auf dem Weg zum neuen Menschen', in Peter Christian Ludz (ed.), *Wissenschaft und Gesellschaft in der DDR*, (Munich, Carl Hanser Verlag, 1979), p 215
[38] Naimark, *The Russians in Germany*, pp 451 – 452; Connelly, *Captive University*, pp 35; 58 – 62

Measures of the Second Higher Education Reform Bill

The State Secretariat for Higher Education was created in 1951 and the following year saw the abolition of education ministries in the individual *Länder* thus effectively centralising control of the education system. In contrast to some other socialist countries the *Hochschulen* mostly retained their traditional structure; however, the new higher education institutions which were created were much more specialised and narrowly focused such as the Institute for the Construction of Heavy Machinery in Wildau and the Institute for Post and Telecommunications in Leipzig. Moreover, almost entirely technical in nature, they were usually sited close to an area of relevant industrial production in order to break down the traditional exclusivity of higher education and tighten the links between research and practice. [39] The content of the teaching was completely restructured in order to promote the creation of a new, socialist type of (wo)man later defined by Ulbricht as possessing a high level of education and demonstrating "enthusiasm for responsibility, creativity and boldness…[and] ... business competence, sober calculation and iron work discipline". The (wo)man formed through socialism would reject characteristics such as envy, egotism and the striving for possessions (*Besitzstreben*), fulfilling his/her own interests only if they accorded with greater societal and political interests.[40] In theory, moreover, through productive work the individual would achieve not only self-fulfilment but the fulfilment of a humane society.[41]

'Basic studies in social sciences' (*gesellschaftswissenschaftliches Grundstudium*), typically dialectical and historical materialism, scientific socialism, the political economy of capitalism and socialism and the history of the German working class movement, became compulsory as did military training exercises, Russian language and sport. The study of the principles of Marxism-Leninism was regarded as the "foundation for the theoretical and practical solution for the development problems of our socialist society" and "the basis of all specialised study", at that point occupying twenty percent or more of the student curriculum.[42] Together with very tightly scheduled curricula which taught much more narrowly defined specialisms than previously, the students were required to spend a minimum of 28 to 32 hours per week in the classroom, while a further twelve to fourteen hours of independent study, policed by the *Freie Deutsche Jugend* (Youth Brigade or

[39] *Protokoll des III. Parteitages der Sozialistischen Einheitspartei Deutschlands*, (Berlin, Dietz Verlag, 1951), p 397
[40] Walter Ulbricht, *Die Durchführung der ökonomischen Politik im Planjahr 1964*, speech at the Fifth Plenum of the SED Central Committee (Berlin, Dietz Verlag, 1964), pp 31 – 32
[41] Siebert, 'Auf dem Weg zum neuen Menschen – Pädagogik und Bildungspolitik in der DDR', pp 208 – 209
[42] Baylis, *The Technical Intelligentsia*, pp 53 – 54

FDJ), was necessary in order to be able to keep up with the study plans.[43] In addition, the academic year was extended from seven to ten months, following the Soviet pattern. This was ostensibly to ensure that students had time during their studies for a 'practical' placement in their chosen line of work;[44] however, in practice this was extended as the FDJ sent students for a further spell of work experience during their two-month vacation period.[45] In addition to this, the FDJ organised fortnightly propaganda activities which involved groups of students in such projects as the renovation of apartments and improving environmental hygiene by making dustbins. The goal was to increase trust in the socialist system among those renting the apartments and to set "a significant example" to the West.[46]

Effects of the Second Higher Education Reform

There are a number of points to be made here. Firstly, the curricular changes and extension to the academic year were implemented within a very rapid time frame causing often quite severe organisational and timetabling problems and frequently adding hours to the students' day because of the necessity to travel between different campuses.[47] Secondly, the necessary materials for the teaching of a number of subjects, historical and dialectical materialism in particular, were either in short supply or altogether unavailable, leading to poor instruction in the subject.[48] Thirdly, the main aim of Marxist-Leninist teaching was to establish the doctrine as a credible philosophy, the theories and methods of which were equally applicable to all academic disciplines.[49] However, the vast majority of students did not take Marxist-Leninist studies seriously, in part because of the "atrocious"[50] standard of teaching: on average there were 350 students per lecturer and much of the teaching was very formulaic. Moreover, it had no academic respectability. For a time at least, there was no career structure in place for Marxist-Leninist specialists and there was strenuous resistance to its introduction from the East German professoriate, which also initially declined to administer the examinations.[51]

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[43] Connelly, *Captive University*, p 64; Augustine, *Red Prometheus*, pp 55 – 56
[44] *Protokoll des III. Parteitages der Sozialistischen Einheitspartei Deutschlands*, p 397
[45] Connelly, *Captive University*, p 64
[46] 'Beschlussvorlage der Studenten der Gewerkschaftsgruppe der Arbeiter- und Bauernfakultät der Humboldt-Universität Berlin', 19.1.55, pp 7 – 8, SAPMO DY 53/194
[47] 'Connelly, *Captive University*, p 63
[48] 'Beschlussvorlage der Studenten der Gewerkschaftsgruppe der Arbeiter- und Bauernfakultät der Humboldt-Universität Berlin', 19.1.55, p 1
[49] Förtsch, 'Science, Higher Education and Technology Policy', p 28
[50] Schmutzler, quoted in Connelly, *Captive University*, p 213
[51] Connelly, *Captive University*, p 213

Fourthly, many of the students were completely overloaded by the amount of work demanded of them. Even those students in the worker/peasant faculties who might have been expected to be the most loyal, felt compelled to state that:

> A large proportion of our friends are being seriously over-burdened in terms of work – this leads to 'over-nervousness' and eventually to illness, forcing them to give up their studies for long periods[52]

Indeed, by early 1950 more than fifty of the worker/peasant students at the Humboldt had suffered nervous breakdowns and a further eighty had contracted tuberculosis. The causes included overcrowding and stress arising from the application of a selection process which took little account of ability or previous training while the curriculum required them to complete preparatory courses for university-level studies, which would previously have taken years, within a matter of months. The curtailing of vacation and leisure time could, therefore, only exacerbate the situation.[53] Underfunding was another problem. Building programmes were insufficient and there was a lack of even the basic equipment necessary for scientific training and research. In addition, student residences were wholly inadequate. For example, students in the ABF at the Humboldt University in Berlin complained of rooms never being cleaned; bad and insufficient food; the equally filthy state of dining areas and kitchen staff; and facilities designed for 200 people having to house 900. Moreover, student grants were inadequate: after paying for basic living expenses in the residences and travel costs, they were left with only around fifteen marks per month with which to buy books and supplies.[54] Facilities for teaching personnel appeared little better. It is hardly surprising then that students did not perform as well as they otherwise might, nor that teaching or research were compromised.

Fifth, the revision of the curriculum and the expansion of the school year was accompanied by a doubling of the number of students between 1950 and 1955. This was mandated by the First Five-Year Plan in order to train a total of 33,500 engineers and technologists for industry, 10,000 for construction and 10,000 for transport and to increase the number of graduates in the labour force by more than 113 percent before 1955.[55] Thus, an already overstretched teaching body had to take on even heavier teaching loads resulting in a

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[52] 'Beschlussvorlage der Studenten der Gewerkschaftsgruppe der Arbeiter- und Bauernfakultät der Humboldt-Universität Berlin', p 17
[53] Connelly, *Captive University,* pp 246 – 247
[54] 'Beschlussvorlage der Studenten der Gewerkschaftsgruppe der Arbeiter- und Bauernfakultät der Humboldt-Universität Berlin', pp 12 – 14
[55] *Protokoll des III. Parteitages der Sozialistischen Einheitspartei Deutschlands*, Vol.1, pp 381 – 382; pp 395 – 398

further decline in the quality of teaching and much less time for research. For example, where there had been 54.5 students per full professor in 1948, this rose to 74.5 in 1952, considerably in excess of the West German professor/student ratio of 1:50 in 1958 (see chapter 3).[56] This was compounded by natural wastage, emigration westwards, the loss of the brightest academic talent to the *Akademie der Wissenschaften* and the tendency of many young assistant professors and other junior academics to leave academia altogether for the better salaries on offer in industry.[57] As a consequence, graduate students increasingly taught many of the courses[58] and increasing numbers of young and inexperienced 'socialist' academics were employed. There appeared to be a general underestimation of the role of individual talent in the scientific process by the authorities and an assumption that professional shortcomings could, with a little effort, be easily overcome providing that the political fundamentals were in place.[59] Thus, the percentage of teachers without even a doctoral qualification rose from 18 to 28 percent and the number of non-academics on the teaching staff also rose exponentially leading to a further dilution of teaching standards,[60] while research programmes were, at best, subject to significant disruption. Moreover, since most of the academic research in classical engineering still took place within the *Hochschulen*,[61] student overcrowding, lengthy study periods and high teaching and administrative loads all contributed to the impairment of research potential in this most crucial of the GDR's priority areas.

Finally, prior to the reform, there had been a constant tension between the need to let the scientists and technologists perform their craft and the desire of the Party to intensify control over them on behalf of the new system.[62] The reform increased the control of the central political administration over all aspects of scientific work from deciding which scientific papers could be published and the allocation of funding, through to the monopoly it exercised on the recruitment, training and placing of personnel. Thus, political leaders could and did intervene increasingly in scientific and scholarly investigations, the development of scientific theory, the distribution of scientific information and decisions as to which areas of scientific investigation were ideologically appropriate. Attempts to deviate from the prescribed path were liable to result in dismissal at best, prison at worst. However, along with greater control went the possibility that the interference of the state

[56] Connelly, *Captive University*, p 64
[57] 'Bericht über den Instructeureinsatz am 15.1.1953 in der Technische Hochschule Dresden', SAPMO DY 53/194
[58] Augustine, *Red Prometheus*, p 55
[59] See for example Siegmund-Schulze, 'The Shadow of National Socialism', p 75
[60] Connelly, *Captive University*, p 64; Siegmund-Schulze, 'The Shadow of National Socialism', p 75
[61] Bentley, *Research and Technology in the former German Democratic Republic*, p 82
[62] Siegmund-Schulze, 'The Shadow of National Socialism', pp 73 – 74

was incompetent or at least unhelpful. Förtsch argues, for example, that the wrapping of scientific endeavour in such an ideological and bureaucratic straitjacket inevitably had the effect of stifling creativity and innovative activity.[63]

Brain Drain

The second five-year plan demanded the enrolment of yet a further 23,000 distance learners and 84,000 fulltime students.[64] In part, these increases were needed to compensate for the constant stream of those leaving for the West. Of well over 2,200,000 emigrants, roughly two thirds were of working age[65] and at least one third held academic degrees.[66] Large numbers of the dispossessed and former bourgeoisie left, taking with them expertise in farming, industrial leadership and science and technology despite efforts to retain the latter in the form of improved pay and working conditions.[67] At the height of the exodus around 100 engineers were leaving every month, compromising critical research projects and causing near crisis in some industries. By 1958, a shortfall of 30,000 engineers was being predicted for the future.[68] Although the exodus was somewhat counteracted by an influx of around half a million from the West which included a number of the original refugees from the East, virtually none of the returnees belonged to the scientific and technological intelligentsia.[69] One solution to the shortfall was to encourage greater female participation both in higher education and the workforce. In order to increase female participation in the workforce to 42 percent, a rise in female university admissions to forty percent was mandated.[70] In practice, the proportion of female students in technical colleges rose to 12 percent in 1961 and 17 percent in 1964, and in universities to six percent and 9 percent respectively. The women were particularly encouraged to adopt a career in science or engineering and in 1965 a quota system was introduced to ensure that female admission levels to university engineering programmes increased.[71]

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[63] Förtsch, 'Science, Higher Education and Technology Policy', pp 33 – 34
[64] *Protokoll der III. Parteikonferenz der SED ,* (Berlin, Dietz Verlag, 1956), Vol 2, p 1106
[65] Sontheimer and Bleek, *Die DDR: Politik, Gesellschaft, Wirtschaft,* pp 191 – 192. Estimates vary considerably: see for instance Stokes, *Constructing Socialism,* p 43, who estimates the number at around 3.5 million
[66] Raymond Bentley, *Technological Change in the German Democratic Republic,* (Boulder, Col., Westview Press, 1984), p 2
[67] *Protokoll der 1. Parteikonferenz der Sozialistische Einheitspartei Deutschlands,* p 206; for a discussion on this see Baylis, *The Technical Intelligentsia,* pp 30 - 33
[68] Delores Augustine, 'Frustrated Technocrats: Engineers in the Ulbricht Era', in Macrakis and Hoffman (eds), *Science under Socialism,* p 185.
[69] Stokes, *Constructing Socialism,* pp 43 – 45
[70] *Protokoll des III. Parteitages der Sozialistischen Einheitspartei Deutschlands,* Vol.1, pp 397 - 398
[71] Augustine, *Red Prometheus,* pp 97 – 99

Technology Transfer

By the time of the third Party Conference of the SED in 1956, West Germany had joined NATO and the GDR was a member of the newly founded Warsaw Pact. This intensification of the Cold War led directly to the foundation of the Research Council of the GDR, attached directly to the council of Ministers, with the remit of controlling the main directions of research in order to focus science and technology on the task of producing the GDR's "economic miracle" and outperforming the industrial production of the West.[72] In light of the failure of a number of industries such as mechanical engineering, the foundries, metallurgy, light industry and agriculture to achieve their planned targets in terms of production and worker productivity rates, increased pressure was placed on higher education to produce a technical intelligentsia and the research capable of making this happen. At the third Party conference, however, Ulbricht pointed out that despite the development of innovative production processes for several economic areas, very little of it had actually been introduced into East German firms.[73]

There were many reasons for this anomaly, one being that despite the creation of bilateral commissions in an attempt to ensure the transfer of information between government and the sciences and the development of 'friendship contracts' and partnerships between the *Hochschulen* and firms, the uptake and exploitation of scientific advance in the production processes was often hindered through the failure of the central planners to transmit the scientific data and/or to come to a decision as to its introduction in the workplace.[74] Another was the frequent lack of relevant technical knowledge and adequate experience in planning in the majority of those responsible for the central planning of R&D, leading to time and money being wasted on non-essential and frequently useless projects.[75] There were, moreover, few material incentives for firms to put process innovations or new designs into production. State investment funding was rarely adequate to cover the costs; moreover, the 'downtime' in production caused through a changeover of processes would imperil the achievement of monthly/yearly production figures and thus lead to the potential non-payment of bonuses. In any case, inadequate and inferior equipment and machinery along with the usual East German problems of obtaining materials and components and a chronic shortage of personnel combined to render the adoption of innovations extremely difficult. Ulbricht also highlighted the wholly unsatisfactory level of cooperation between

[72] Giles, 'The Structure of Higher Education in the German Democratic Republic', p 134
[73] Ulbricht, in *Protokoll der 3. Parteikonferenz der Sozialistischen Einheitspartei Deutschlands*, pp 32, 36, 43
[74] Förtsch, 'Science, Higher Education and Technology Policy', pp 33 – 34
[75] Bentley, *Technological change in the German Democratic Republic*, p 62; Augustine, *Red Prometheus*, p 88

production and markets which resulted in industry frequently producing goods which did not correspond to what people wanted. This lack of coordination was again due, at least in part, to the strongly bureaucratic central planning process which largely ignored market research into consumer and industrial needs and appeared to dictate priorities regardless of cost or economic usefulness.[76] The upshot was a system of production which tended to hold on to the old, only very slowly permitting the introduction of innovation in goods and working and production methods, thus hindering progress.

By the time of the fifth SED party conference in 1958, the party had abandoned the second five-year plan with its 'Stalinist' emphasis on heavy industry, supplanting it with the first seven-year plan covering the period 1959 – 1965. The new goal had become to overtake West Germany in the per capita consumption of the most important food and consumer goods within a few years. In the *Hochschulen* this translated to even greater concentration on these specific areas of the economy, demands for the achievement of more rapid progress in science and technology to compensate for the poverty of domestic raw materials and to ensure the production of high-quality goods, a greater degree of specialisation within disciplines and the more extensive use of contract research from large industrial firms.[77] Not surprisingly, the statistics for the number of academics fleeing to the West showed a sharp rise from this point as the following table demonstrates, almost certainly reflecting the pressure under which they found themselves:

Table 4.1

Numbers of academics emigrating to the West 1955 – 1960

Year	Numbers Fleeing
1955	56
1956	43
1957	58
1958	208
1959	188
1960	142

Source: Rexin, 'Die Entwicklung der Wissenschaftspolitik in der DDR', p 119

[76] Augustine, 'Frustrated Technocrats: Engineers in the Ulbricht Era', in Macrakis and Hoffman (eds), *Science under Socialism: East Germany in Comparative Perspective*, p 194
[77] Manfred Rexin, 'Die Entwicklung der Wissenschaftspolitik in der DDR', in Peter Christian Ludz (ed.), *Wissenschaft und Gesellschaft in der DDR*, p 100

Rexin also makes the point that this was at a time when the general level of flight to the West had been falling due to improved living conditions and the end of rationing. The building of the Berlin Wall in 1961 may have prevented the escape of any more of its technical intelligentsia to the West; however, it also had the secondary effect of virtually ending any further academic contact or exchange of ideas with western scientists for any but a very few trusted professors. In an echo of the situation during the years of National Socialism, the inevitable effect on East German science was impoverishing.

The New Economic System

Concerned about deteriorating economic performance, the effect that comparison with the living standards of West Germany was having on the population and its political morale and believing that the viability of socialism in his country depended on its ability to out-perform West Germany economically, Ulbricht introduced a measure of economic liberalisation in the form of the New Economic System (NES) in 1963. In what was a de facto recognition of the inability of conventional socialist doctrine and practice to create the necessary level of economic growth,[78] the NES involved a decentralisation of responsibility to the industrial associations, reform of industrial prices, the re-evaluation of enterprise capital stock as well as the introduction of the use of profit as the main enterprise performance indicator as well as a source of investment over and above state loans. Contractual relations between enterprises were restructured and incentives provided for enterprises through contracts, capital taxation and the ability to distribute some of their profits in the form of bonuses. While the use of central planning was in no way diminished, its role was to be re-directed to technical development rather than, as it so often was, crisis management. However, the control of the structure-determining industries (those defined as important in the bid to overtake the West in the key sectors of chemicals, machine-building and electronics) remained firmly in the hands of the planners.[79]

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[78] Hubert Laitko, 'The Reform Package of the 1960s: The Policy Finale of the Ulbricht Era', in Macrakis and Hoffman, *Science under Socialism*, pp 45, 56; Steiner, *Von Plan zu Plan*, pp 128 - 133

[79] Jeffrey Kopstein, *The Politics of Economic Decline in East Germany 1945 – 1989*, (Chapel Hill, University of North Carolina Press, 1997), pp 48 – 50; see also Steiner, *Von Plan zu Plan*, pp 129 – 142

The NES and Academia

The NES also had implications for academia. The previously discussed abolition of most of the ABF was accompanied by a shift in criteria for university entrance to academic performance, with particular emphasis on the promotion of the especially gifted. This ultimately led to a sharp drop in the proportion of working class students to around 36.6 percent in 1967 with a corresponding increase in those from white-collar or intelligentsia backgrounds.[80] Allied to this was another great push to triple the numbers of graduate engineers and industrial scientists in order to try and remain competitive with the West in the pursuit of the 'scientific-technological revolution'. However, a significant problem was posed by the very poor uptake of engineering graduates by industry: even by 1964 only 30 percent of engineering graduates were actually being placed in positions consistent with their qualifications.[81] The regime argued that its utilisation of graduates in the workforce lagged very considerably behind that of Russia and many western nations and that there was a chronic shortage in industry of degree-holders capable of research and product development.[82] Moreover, in the key area of electronics and semiconductors, there was a grievous lack of "scientifically grounded work, technological discipline and qualified personnel"[83] which was in large part responsible for the poor quality and insufficient production of electronic components which, in turn, seriously affected the standard of high-tech research in the GDR. Some of the fault lay within the firms where, Augustine argues, management subscribed to the view that qualifications were of less importance than experience in the workplace and refused to employ graduates in more senior positions. Others specifically discriminated against the hiring of young graduate engineers because of resentment towards the Party's policy of granting special treatment to the older technical intelligentsia in an effort to keep them in the GDR, while the older engineers distrusted the quality of training received by the new.[84] Whatever the reasons, the failure to exploit the talents of the graduate engineers amounted to a considerable waste of human capital.

By 1967 the Party was calling for one in four school leavers to undertake some form of tertiary education in order to cope with the rising level of mechanisation and automation in production processes, the extensive use of electronic data processing, the increasing use of

[80] Baylis, *Technical Intelligentsia*, pp 48 - 49
[81] Baylis, *The Technical Intelligentsia*, pp 45 – 46
[82] Ulbricht, cited in Baylis, *The Technical Intelligentsia*, p 46
[83] Werner Hartmann, quoted in Augustine, *Red Prometheus*, p 126
[84] Augustine, *Red Prometheus*, pp 78; 82 – 83

chemicals in industry and agriculture, the introduction of new production materials including plastics and the use of atomic energy.[85] Ten new engineering colleges were built between 1967 and 1971[86] and the numbers of higher level engineering science students increased by 62.2 percent from 28,344 in 1965 to 45,967 in 1970, while those in mathematics and natural sciences rose by 45.6 percent from 9,313 to 13,563 over the same period.[87] Just as in West Germany, the expansion allowed a considerable number of graduates of *Fachschulen* a chance of social mobility by progressing to *Hochschulen* and attaining a higher-level degree. Some younger factory workers were 'delegated' to attend *Hochschulen* on a full-time basis, while older workers were encouraged to undertake part-time, distance or correspondence courses. Additionally, admission standards to *Hochschulen* were lowered, as were the marking standards in a number of *Hochschulen* in order to increase the retention of poorer students and raise pass rates.[88] The implications for the standard of education attained by many students and for their subsequent effectiveness in the workplace are obvious.

More stress was also laid on the need for academic science to support industry by increasing the amount of contract research conducted for individual firms. Even in 1963 forty percent of research funding for higher education was coming from industry and VVB contracts, although in the technical sciences this reached sixty percent. Additionally, thirty percent of GDR state funding for research in higher education was also directed towards projects of direct relevance to industry.[89] For the sake of comparison, the highest proportion of industry-financed research in the OECD countries was in Spain (6.8 percent) and Ireland (5.1 percent).[90]

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[85] *Protokoll der VII.Parteitages der Sozialistischen Einheitspartei Deutschlands*, Vol.1, pp 113, 120, 255; see also Bentley, *Research and Technology in the Former German Democratic Republic*, p 92; Augustine, *Red Prometheus*, p 96

[86] Bentley, *Research and Development in the Former German Democratic Republic*, p 92

[87] Rytlewski and Opp de Hipt, *Die Deutsche Demokratische Republik in Zahlen 1945/49 – 1980*, p 160

[88] Report from SAPMO, DY 30 IV 2/9.04/352 pp 195 – 199; memorandum from 25.3.59 in SAPMO, DY 30 IV 2/9.04/478; memorandum from 29.6.2009 in SAPMO, DY 30 IV 2/9.04/379 cited in Augustine, *Red Prometheus*, pp 96 – 97

[89] 'Aktennotiz über eine Aussprache bei Genossen Dr. Hiring, Abteilungsleiter Gesundheitspolitik im ZentralKommittee der SED', 10.9.68, SAPMO, DY 30/IV A 2/9.04/66

[90] OECD, *Gaps in Technology: Comparisons between Member Countries in Education, Research and Development, Technological Innovation and International Economic Exchanges*, (Paris, OECD, 1970), p 116

Third Higher Education Reform

The third reform was touted as "a contribution to the class war with West German imperialism" and as a "historically necessary alternative to West Germany"[91] and was, arguably, the most transformative of the three. Ever since the passing of the second higher education reform bill the SED had been seeking ways to finally destroy the last remnants of the traditional German higher education system and break the power of those professors who had contrived to maintain academic freedom and autonomy and were thus considered a threat to the authority of the political establishment.[92] There had been consistent complaints that "old practices were still being followed" and that "many teaching staff still teach precisely what they want to".[93] Active resistance had been especially strong in the medical schools and faculties of natural sciences with, for instance, the universities of Greifswald, Jena, Dresden and Karl-Marx-Stadt proving particularly truculent.[94] There seemed to be some diversity of opinion regarding the objectives of the reform, reflecting the increasing divisions within the government as a result of the introduction of the NES and Ulbricht's increasingly extravagant plans for the pursuit of the scientific-technological revolution. One faction of government seemed to see it as the logical extension of the NES, instigated because the sort of ideas representative of the NES were being developed too slowly and hesitantly in the decisive areas of teaching and education.[95] More recent historiography, however, seems to concur with the view that the reform was "an intraparty counter-reform" by the more Stalinist faction of the Party: part of the movement to claw back the partial autonomy which science and the economy had enjoyed since 1963 and, through organisational and structural change, reinforce centralised control and firmly bind university teaching and research to industry and the economy.[96] The reform finally confirmed the central control of the SED, virtually removed any remaining vestige of autonomy and completed the economisation of technical and professional training.

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[91] 'Durchführung der Hochschulreform der DDR', p 4, SAPMO, DY 30/IV A 2/9.04/511
[92] Jessen, *Akademische Elite*, pp 180 – 205; Augustine, *Red Prometheus*, pp 99 – 100; Förtsch, 'Science, Higher Education and Technology Policy', pp 41 – 42
[93] 'Bericht über die Wahlversammlung der APO Gesellschaftswissenschaften im Staatssekretariat für das Hoch- und Fachschulwesen', 13.4.64, pp 1 – 2, SAPMO, DY 30/IV A 2/9.04/66
[94] 'Arbeitsplan des Staatssekretariat für das Hoch- und Fachschulwesen für das Jahr 1963', pp 3 – 11, SAPMO DY 30/IV A 2/9.04/66
[95] 'Bericht über die Wahlversammlung der APO Gesellschaftswissenschaften im Staatssekretariat für das Hoch- und Fachschulwesen', 13.4.64, p 2
[96] See for example Rainer Hohlfeld, 'Between Autonomy and State Control: Genetic and Biomedical Research', in Macrakis and Hoffman (eds), *Science under Socialism*, pp 251 – 252; Augustine, *Red Prometheus*, p 101

Measures of the Third Higher Education Reform Bill

The reform (put out for consultation in 1966) reduced undergraduate study time to four years and divided it into two stages: basic study (*Grundstudium*) and major subject study (*Fachstudium*). *Grundstudium* consisted of general and some specialist knowledge of the natural and social sciences; foreign language training, particularly in Russian, in order to be able to read scientific and technical texts; basic instruction in scientific work methodology; sport and military training. Study plans consisted of a maximum of 32 hours per week of compulsory lectures with the acquired knowledge being deepened and "firmly established through practice". As early as 1963, experiments had been conducted at the Technical University of Dresden, with regard to students spending much longer spells on practical placements because industrial enterprises consistently complained that, despite the good scientific grounding of the graduates, many found it hard to translate their skills into practice, introduce new innovations and cope with the training and management of the collectives.[97] Thus, the *Fachstudium* included a placement in an engineering or industrial complex. The rest of the time was taken up by core compulsory and elective lectures in the particular subject area, its theoretical bases and related problems in the areas of mathematics, natural and social sciences, technology and economics. Success in the *Hauptprüfung* or final examination entitled the successful candidate to bear the title of his/her profession (*Berufsbezeichnung*), i.e. Diplom-Juristen, Diplom-Ingenieur.

Postgraduate study took three different forms. *Spezialstudium* (special study) was a one-year course of independent study which rewarded the student with a faculty diploma in a branch of science and ostensibly allowed the student to enter industrial practice armed with the most up-to-date science in the specialist area. *Forschungsstudium* (research study) was a two – three year course leading to a doctoral degree in an individual branch of science. The aim was to produce doctoral cadres for industry, and to this end the students were required to spend a prolonged period of time in a collective of socialist employees as a manager. The doctoral work could be pursued either in the *Hochschule*, the *Akademie der Wissenschaften* or in the chosen firm; moreover, it was also possible to achieve a doctorate as an external candidate.[98] The third degree category, that of Doctor of the Sciences,

[97] *Protokoll des VI. Parteitages der Sozialistischen Einheitspartei Deutschlands*, Vol. 4, pp 192 – 193
[98] 'Erläuterung zur weiteren Entwicklung der Lehre und Forschung an den Universitäten und Hochschulen der DDR', 5.1.66, pp 2 – 12, SAPMO DY 27/5832

comparable to the designation of Dr.Sc. in the USA or Russia, required very high achievement levels and a considerable level of experience in the field.[99]

The structural reforms also encompassed a sweeping re-organisation of university institutions. The traditional institutional grouping around 'chairs' was abolished, with nationally, 190 departments replacing around 960 institutes. Faculties were combined into much larger units called *Sektionen* (sections), under the management of a single director, and described as:

> The collecting together of the scientific potential of the institutes of one or many scientific areas for the development of concentration and cooperation in teaching, training and research across previous faculty boundaries [100]

The idea was to obviate the danger that the same things were being researched at different places with the same objectives and achieving the same results at considerable cost to the state.[101] Along with this went the 'profiling' of higher education institutions. This involved the development of complex centres of teaching and research in specific scientific areas or special foci (*Schwerpunkte*) determined by the Five-Year Plan and based on the type of industry in the immediate area of the university or *Hochschule* concerned.[102] In theory, this would aid the development of complex collaborative and interdisciplinary projects utilising the research capability of universities and *Hochschulen*, the Academies of Science and Agriculture, industry and agricultural collectives.[103] Thus, national scientific potential would become much more closely integrated while specialisation would concentrate scientific and material resources and funding, lead to better cooperation between research institutes, state organs and 'partners' such as the *Volkseigener Betriebe* ('People-owned' enterprises or VEBs), make easier focused-based research and, finally, permit rationalisation in the use of instruments, materials, libraries and work stations.[104]

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[99] 'Vorlage für das Politbüro von dem Minsterium für Hoch- und Fachschulwesen', (no date given, probably 1966), p 6, SAPMO DY 30/IV A 2/9.04/376

[100] 'Erläuterung zur weiteren Entwicklung der Lehre und Forschung an den Universitäten und Hochschulen der DDR', p 24

[101] Report on two investigations at the Karl-Marx-Universität Leipzig (29 – 30 October 1969) and the Universität Rostock (2 – 3 December 1969), 23.1.1970, pp 9 – 21, SAPMO DY 30/IV A 2/9.04/510

[102] 'Erläuterung zur weiteren Entwicklung der Lehre und Forschung an den Universitäten und Hochschulen der DDR', from the Staatssekretariat für das Hoch- und Fachschulwesen, pp 20 – 24

[103] Gregor Schirmer, Stellvertreter des Ministers für Hoch- und Fachschulwesen, 'Hochschulreform und geistiges Leben. Über Eigenschaften des sozialistischen Hochschullehrers', 1969, p 1, SAPMO DY 27/5832

[104] 'Erläuterung zur weiteren Entwicklung der Lehre und Forschung an den Universitäten und Hochschulen der DDR', pp 2 – 3

Virtually all research in the *Hochschulen* was to be undertaken on the basis of a contractual agreement with an industrial enterprise, in effect, allocating academic research and development facilities to those firms which lacked their own.[105] Nevertheless, as the Minister for Higher Education made clear, research was to be concentrated on the 'structure-defining tasks' (*strukturbestimmende Aufgaben*) of socialist *Großforschung* (large-scale research). Arguments in defence of small-scale practical research projects contracted with and financed by industrial or agricultural 'partners' were dismissed as unworthy of the true socialist researcher, whose aim should be the success of the socialist common research projects which were considered "the only possible way to top achievement at international level".[106]

Problems in Implementing the Third Higher Education Reform[107]

Ulbricht had intended that the reform should be a major contributor to the GDR's overtaking of top international levels of science and technology, even improving on the USA's productivity levels and standard of living.[108] While many of the ideas, such as increased cooperation in teaching, training and research, the rationalisation of cost and effort and investment for the future appeared both logical and laudable, many of the shortcomings apparent in the reform's implementation can be attributed to the same issues which hampered the general economic development of the country: the inefficiencies inherent in a centrally-planned economy and the primacy of political loyalty over ability. When well planned, the new structure was extremely effective, especially in the pursuit of highly complex research and in enhancing the university education derived from it. It was also a means of encouraging the collaboration of scientists of all ages and academic degrees. In other cases it was wholly counter-productive, the new *Sektionen* consisting of little more than a collection of unrelated institutes linked by nothing more than bureaucratic decree. They also appeared to be relatively unsuccessful in fostering interdisciplinary work. Moreover, many smaller, more peripheral fields of research ended

[105] Bentley, *Research and Development in the Former German Democratic Republic*, pp 82 – 86; for an opposing viewpoint from the GDR perspective see H. Irmer and B. Wilms, 'New Forms of Co-operation for Research in the German Democratic Republic between Higher Education Institutions and Industry' in *Higher Education in Europe*, Vol.9, No.4, 1984, pp 35 – 40

[106] Gregor Schirmer, 'Hochschulreform und geistiges Leben. Über Eigenschaften des sozialistischen Hochschullehrers', p 7

[107] Although not yet officially passed and implemented, the implementation of many of the provisions of the Third Reform Bill began in a number of *Hochschulen* from 1966 onwards

[108] Augustine, *Red Prometheus*, p 113

up being "structured out of existence" altogether because they could not demonstrate their relevance to the state plans, thus increasing the inflexibility of the system.[109]

There was a great deal of initial opposition from academics, some referring to profiling as the work of "political dilettantes" and 'socialist competition' in science as "unacademic".[110] In comparison to other faculties, mathematics/natural sciences faculties again appeared to be particularly resistant to restructuring and the encroachment of state influence on teaching and research. The situation at the University of Greifswald was illustrative of a widespread trend. The planners were extremely keen to expand provision in biology, mathematics, physics and chemistry but these, according to the SED, were the areas where "political/moral education and training are the least far advanced". Only a small group of junior academics was apparently able to recognise the "qualitative" virtues of the new system, while many others in the mathematics/natural sciences faculty tried to move into medicine instead which remained less strictly ideologically controlled, partly because of a chronic shortage of medical personnel.[111] The response of the Party was to instigate a comprehensive programme of re-education within the university for staff and students alike in order to help them grasp "the deeper concepts and complexity of the international class war", while the top positions in the new set-up went to those younger academics who demonstrated "understanding of the guiding principles".[112] The obvious danger of this course of action was twofold: the demotivation of the more experienced professors and the promotion of those with less academic ability and experience but a more opportunistic approach to career-building, allowing them to guide academic development in the *Hochschulen*, albeit under the control of university administrators answerable directly to the state and the SED.[113]

Dissent at the passing of the bill was widespread, however, and was heightened by the fall-out from the suppression of the Prague Spring uprising in August of the same year, Western student unrest and by the increasing influence of Western media and the counter-culture movement on the university population.[114] Other complaints from academics were

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[109] Laitko, 'The Reform Package of the 1960s: The Policy Finale of the Ulbricht Era', p 57

[110] 'Probleme der Profilierung an der Mathematische/Naturwissenschaftliche Fakultät Greifswald', 1.2.68, p 3, SAPMO DY 30/IV A 2/9.04/35

[111] 'Probleme der Profilierung an der Mathematische/Naturwissenschaftliche Fakultät Greifswald', 1.2.68, pp 3 – 5

[112] 'Analyse über die politische-ideologische Situation an der Erst-Moritz-Arnst Universität (Greifswald) und über das Denken der Wissenschaftler und Studenten in Durchführung der 3. Hochschulreform 30.9.68, SAPMO DY 30/IV A 2/9.04/35

[113] Jessen, *Akademische Elite*, pp 184 – 192; Augustine, *Red Prometheus*, pp 99 - 100

[114] Letter from Abteilungsleiter Hörnig to Kurt Hager: 'Weiteres Material über die Martin-Luther-Universität Halle', 11.6.68, SAPMO DY 30/IV A 2/9.04/35

that the new structure of studies was too inflexible to suit all disciplines. This was particularly so in engineering, where they argued that it was impossible to design the mandated one basic study plan which would conform to all engineering sectors because teaching plans required to be continually re-worked based on emerging technology in the different fields. There were also, unsurprisingly, numerous complaints about the poor educational standard and motivation of new student entrants.[115] Another widespread and ongoing problem concerned the work placements: in practice, enterprises were frequently unable to place students either in the type of work they were qualified to do or the area in which they were studying, while the economic pressure of having to earn a living did "not always support the combination of practical work and theory".[116]

The third reform also suffered from the traditional East German vices of poor planning and execution aggravated by underfunding. There was a substantial 'raking back' of money by the government for new building projects, which it had previously guaranteed as part of the reform, without any corresponding reduction in the tasks of the *Hochschulen*. For example, building delays at the TH Karl-Marx-Stadt were caused because the government did not pay the agreed money to the building firm.[117] The resultant failure to complete the new Section building for electronics, information processing and automation technology meant that instead of the planned 4,010 entrants, only 750 could be admitted, "with obvious consequences for the development of the economy".[118] Letters regarding the planned new building of the *Ingenieur Hochschule für Elektronik* in Dresden indicated that the ground area was simply not big enough and also forecast delays in completion of at least two years incurring a financial loss of at least 600,000 marks.[119] The *Politbüro* also suggested that the building programme of the Friedrich-Schiller-University Jena-Lobeda be abandoned altogether and that the research facilities at VEV Carl-Zeiss be used instead, meaning that student numbers could be increased without any expansion of educational capacity. It was acknowledged, however, that this might have "political and ideological

[115] Prof. Em. Dipl-Ing. H. Schröder, 'Gedenken un Überlegungen zu den Prinzipien zur weiteren Entwicklung der Lehre und Forschung an den Hochschulen der DDR' , no date but probably 1968, SAPMO, DY 27/5832
[116] 'Vorlage für das Politbüro von dem Ministerium für Hoch- und Fachschulwesen', no date given but probably 1966/67, p 6, SAPMO, DY 30/IV A 2/9.04/376
[117] Letter from Prof. Weißmantel, rector of the Technische Hochschule Karl-Marx-Stadt to Prof. Hager (secretary of the SED Central Committee), 17.7.69, SAPMO DY 30/IV A 2/9.04/509
[118] Letter from Kempke (representative of the Minister for Higher Education) to Günter Mittag, 30.7.69, SAPMO DY 30/IV A 2/9.04/509
[119] Letter from Prof. Dr. Gießman, Minister for higher education to Prof. Hörnig of the Department of Science of the SED Central Committee, 1.2.68, SAPMO DY 30/IV A 2/9.04/509

implications for the building workers and the university population" and "would not strengthen the trust of the people in the decisions of the party and of government".[120]

It is, therefore, unsurprising that most *Hochschulen* were having difficulties in achieving their recruitment targets despite the planned expansion of student numbers. One stated, for example, that "many of those most suitable for this are opting instead to do a *Fachdiplom* (skilled worker qualification), not least because of the better pay prospects in industry".[121] Professorial numbers also continued to be eroded, despite planned increases in their number, as they too "left for other areas of the economy because of unfairly higher salary offers in industrial firms and institutions"[122] and the implications of the new regulations. Additionally, there arose a serious dichotomy with regard to research. Because enterprises were expected to be financially responsible for the research in the *Hochschulen*, they expected to have their particular requirements prioritised. Many firms showed a marked disinterest in drawing up contracts for long-term research or in their financing.[123] They complained that the *Hochschulen* were not taking their needs into account and that their research effort was too fragmented: for example, the Section for Shipbuilding at the University of Rostock was dividing its efforts between five different industrial complexes. Conversely, many *Hochschulen* complained of badly formulated and ill-thought out contractual proposals from their partner firms and expressed the fear that they were simply being used to service the needs of industry.[124] Moreover, despite Ulbricht's belief that industry's financing of research would lead to an increased translation of research results into production processes, the indications were that the industrial partners were still refusing to implement any innovations which were not of immediate, short-term financial benefit.

The End of the New Economic System

There were, moreover, continuing clashes between the structural development demanded by the leadership and the conflicting goals of many of the enterprises, resulting from the introduction of the NES. Because the goals of industry did not necessarily coincide with

[120] Letter from Kempke to Mittag, 17.11.70
[121] Letter from SED Rostock to Prof. Hager, 12.11.69, pp 4 – 7, SAPMO DY 30/IV A 2/9.04/509
[122] 'Einige Probleme zum Erfüllungsstand des Sonderprograms des Ministerrates über Maßnahmen zur Erhöhung des Bestandes an naturwissenschaftlichen und technologischen Hochschulkadern bis 1975/76', 13.11.69, p 5, SAPMO DY 30/IV A 2/9.04/509
[123] 'Bericht der SED Kreisleitung, Humboldt Universität zu Berlin', 28.10.69, p 8, SAPMO DY 30/IV A 2/9.04/35
[124] 'Bericht über Untersuchungen an der Karl-Marx-Universität Leipzig (29 – 30 Oktober 1969) und der Universität Rostock (2 – 3 Dezember 1969)' 23.1.70, pp 9 – 21, SAPMO DY 30/IV A 2/9.04/510

the longer-term aims of the planners, in an effort to steer technological innovation in the desired direction the planners increasingly allocated preferential access to supplies and labour to 'structure-determining' projects designated as important in the plan to overtake the West in the key sectors of chemicals, machine building and electronics. The number of these multiplied and absorbed increasing amounts of investment and time to the detriment of the contractual obligations negotiated independently by the enterprises.[125] There were, nevertheless, some notable successes and at the end of the 1960s the GDR was still counted amongst the ten most industrialised nations of the world. Moreover, although standards of living lay well below those of West Germany, they were by far the highest in the East European bloc. However, productivity continued to decline even in comparison with that of other Eastern European countries as the following table demonstrates:

Table 4.2

Level of output in selected socialist countries 1950 – 69 (average annual % rates of growth)

	Output (GDP at 1963 factor cost)		**Output per person employed**	
	1950/52-195860	**1958/60-1967/69**	**1950/52-1958/60**	**1958/60-1967/69**
Bulgaria	6.4	7.4	5.7	7.0
Czechoslovakia	5.7	4.8	4.7	3.5
GDR	**7.1**	**4.5**	**6.4**	**4.4**
Hungary	4.1	5.5	2.9	4.8
Poland	6.2	6.0	4.4	4.0
Romania	6.3	8.0	4.8	7.6
Soviet Union	8.3	6.9	6.3	4.7
Yugoslavia	6.4	6.1	5.9	5.0

Source: Derek Aldcroft, *The European Economy 1914 – 1990, 3rd Ed.*, (London, Routledge, 1996), p 174

A 1968 report from the Sector for Higher Education Policy of the Institute for Marxism-Leninism condemned a serious loss of momentum in the economy leading to labour productivity being half that of Japan, with a growth rate since 1960 less than that of both Japan and the USA. It also reported an increase in the material intensity of GDR production, a time-delay in paying bills of over one and half times that of the USA and a rate of development in important, structure-defining branches of industry that lagged behind planned targets. The report concluded that in terms of scientific achievement the GDR remained ten years behind the rest of the world.[126] Certainly, there were other contributory issues, like the Western embargo on the export to the Eastern block of a

[125] Gert Leptin and Manfred Melzer, *Economic Reform in East German Industry*, translated by Roger Clarke, (Oxford, Oxford University Press, 1978), p 79

[126] 'Durchführung der Hochsschulreform der DDR', 1968, pp 2 – 3, SAPMO DY 30/IV A 2/9.04/511

number of products capable of having military application, such as microelectronic components, which seriously affected the development of high-tech industry in the GDR. Furthermore, the Soviet Union, on which the GDR relied for technical assistance, proved reluctant to cooperate with the GDR on technological projects. Ultimately, however, it appeared that Ulbricht's technological dreams for the GDR proved to be far beyond the country's capability to achieve.

By the end of the 1960s, it became obvious that far more engineers, in particular, were being trained in the *Hochschulen* than the economy could possibly absorb.[127] Also increasingly apparent were the divisions created by Ulbricht's policies within the Party. The NES was distrusted by the more hard-line elements who resented the introduction of 'capitalist-style' economic levers. Additionally, the huge increase of research into cybernetics, semiconductors, computers and systems theory aroused the antagonism of a number, who recognised in the introduction of computerisation to planning systems a potential shift of power from the planners to the scientists and mathematicians, something the more conservative Party members were not prepared to accept.[128] Ulbricht's policy of importing Western machinery, for which he planned to pay by using the machinery to create industrial products for export to the West, had led to substantial trade deficits, turning what had been a surplus of $400 million with Western Europe in 1968 into a deficit of $248 million.[129] Moreover, it had involved the development of such close economic ties with the West that the SED hardliners saw it as a step too far. In the end, Ulbricht was forced from power, not least as a result of political pressure from the Soviet Union which was increasingly concerned that Ulbricht's "technocratic dream" of overtaking the West would lead him not only to accumulate large debts in order to do it, but to sacrifice the GDR's ties with the Soviet block if need be.[130]

Conclusion

In a time of heightened international political tension, the desire to differentiate itself from the FRG and adopt Marxist-Leninist values in the creation of a superior socialist society lay behind the three reforms of higher education in East Germany. In some respects this was no bad thing; for example, the GDR could legitimately claim the moral high ground

[127] Augustine, *Red Prometheus*, pp 96, 113 – 114
[128] Stokes, *Constructing Socialism*, pp 148 – 149; Bentley, *Technological Change in the German Democratic Republic*, pp 158 – 159
[129] *United Nations Economic Bulletin for Europe*, Vol. 23, No. 2, 1971, p 21
[130] Kopstein, *The Politics of Economic Decline in East Germany 1945 – 1989*, pp 70 – 71

with respect to its democratisation of higher education long before its Western neighbour. University autonomy disappeared along with the old hierarchical, patriarchal elite which had controlled it and the Party placed its hopes on the creation of a new, loyal, proletarian, technical intelligentsia. In addition to the need for specialists to push forward the technological frontier, the Party was well aware that a well-educated, highly skilled workforce was critical for the successful adoption of technological advances and innovative practices. Logically, there was every reason to suppose that a concentration on particular economic sectors would substantially assist the country's economic development. Higher education was, therefore, continually expanded and focused on chemistry, engineering, mathematics and the natural sciences in order to produce the required number and type of socialist cadres for industry calculated by the central planners.

The problems lay less in the idea, than in its implementation. Because of the financial difficulties of the state and the inefficiencies of the central planning system higher education expansion was always under-funded and under-resourced, compromising both the quality of teaching and research. In the drive to create the new socialist intelligentsia, ideological conformity was usually prized more than academic merit because the Party required "specialists who functioned according to the Plan's discipline", not well-rounded scholars who would be inclined to question the broader social and political questions.[131] Research projects were frequently designed and ranked in priority by inexperienced central planners with little knowledge of the fields in question. With virtually all basic research removed from the remit of the *Hochschulen* to the *Akademie der Wissenschaften,* higher education research became progressively more oriented towards agricultural and industrial production. By making the collectives responsible for research financing, however, discrepancies arose between the shorter-term aims of collectives and the demands of the government for pioneering technological breakthroughs and longer-term perspective planning. Additionally, there were constant and seemingly insurmountable difficulties in translating innovation into production.

The technological status of the GDR was never in any danger of even 'catching-up with', let alone 'overtaking' that of the West. There is general consensus that, until the introduction of the NES, the research and development effort was concentrated too heavily on the lower technology sectors and heavy industry, with too little emphasis placed on more 'modern' areas such as plastics, data processing and electrical machine and apparatus

[131] Connelly, 'The Foundations of Diversity', p 129

construction.[132] The subsequent reversal of policy with a sharp increase of research into the development of high technology resulted in disproportionate economic development and a scarcity of many basic consumer goods. Ultimately societal discontent, the unease of large sections of the party and of the Soviet Union were enough to kill the experiment and see the demise of Walter Ulbricht as leader, heralding a return to the more ideologically comfortable ground of highly centralised economic planning and the end of the pursuit of the scientific-technological revolution.

[132] See for example Bentley, *Technological Change in the German Democratic Republic*, p 200

Part Two: 1970 - 1990

Chapter 5

Change and Reform in West German Higher Education 1969 - 1990

The general perception of higher education in the Federal Republic of Germany (FRG) during the 1970s and 1980s is of the unstoppable momentum of its expansion. This, in turn, gave rise to fears regarding the increasing cost to the public purse, the quality of teaching, the damage caused to the research process by over-burdening the professoriate with teaching and administration duties, the impact of vast numbers of over-educated graduates in the 'wrong' disciplines on the labour market and the inability of the higher education system to orient itself sufficiently to the needs of society. Although student numbers had been steadily increasing in response to demographic development and social changes since the end of WWII, it was not until the mid-1960s that really sizeable quantitative expansion was actively encouraged through reform of the education system in response to concerns detailed in a previous chapter. The transition from 'élite' to 'mass' higher education which took place in the 1970s was far from being unique to Germany; rather the phenomenon was common to most of the industrialised countries of the West including the USA and Great Britain.[1] The process in the FRG, however, was influenced by the persistence of the formalised structure and autonomous status of the *Hochschulen* and complicated by a highly decentralised federal framework with responsibility for education in the remit of the individual *Land* governments, making the process of developing a national educational policy a rather complicated and long drawn-out affair.

1969 arguably represented a turning point in the development of West German higher education. Not only did the end of the 'Grand Coalition' lead to a breakdown in cooperation between the *Länder* and the federal government on education policy, the advent of the first government led by the SPD (*Sozialdemokratische Partei Deutschlands*) since the end of WWII heralded an ostensibly new approach to higher education. To some extent directed by the violent student unrest which was taking place in most of the country's *Hochschulen*, SPD/FDP policy guaranteed entry to higher education to all who reached a certain standard of education as a constitutional right. In human capital terms, the coalition's argument ran that higher education was, in general, the best preparation for

[1] Peter Scott, *The Meanings of Mass Higher Education*, (Buckingham, SRHE and Open University Press, 1995), p 2. Scott uses Trow's definition of an élite system as one enrolling up to fifteen percent of the age group and a mass system as enrolling between 15 and 40 percent of the age group. In West Germany roughly 21.6 percent of the relevant age cohort was in higher level education in 1982

personal development and employment opportunities, while a generally higher level of qualifications would, in a virtuous circle, lead to changes in the structure of the employment system and of the economy creating a corresponding demand for even higher qualifications.[2] This was the antithesis of previous policy initiatives which had attempted to limit higher education expansion by means of restricting entry because of a perceived oversupply of graduates in disciplines which made them hard to employ.[3] The policy was not always observable in the actions of ministers in the first few years of SPD government, as will be demonstrated. However, the constant tension to reconcile economic goals with their social agenda was a predominant feature during the tenure both of the SPD- and the CDU/CSU-led administrations of the 1970s and 1980s.

The aim of this chapter is to explore the impact of the sudden acceleration of student numbers on the educational infrastructure, the labour market and the research effort of the institutions of higher education. It will analyse the policy decisions taken and their implementation through the 1970s and 1980s and offer some tentative hypotheses as to the relationship between higher education and economic growth in the FRG. I propose to deal with the decades separately, examining the policy changes enacted in the 1980s as a response to events in the 1970s because of the restrictions on the use of much archival material beyond the mid-1970s and because of the return of CDU/CSU led administrations in 1982.

1970s

Rapid Expansion

The rise in student numbers in the FRG was swift and appeared largely uncontrolled in comparison to the carefully planned East German experience, leading to pressure for significant internal reform of, and better coordination and cooperation between institutions of higher education. *Bundesminister für Bildung und Wissenschaft* (Minister for Education and Science) Klaus von Dohnanyi argued that it was impossible for large, modern, open universities to try and function to the same rules as the old 'elite' universities. An industrial society, which was aiming for a better standard of living, needed "discerning"

[2] Bundesminister für Bildung und Wissenschaft, 'Antwort auf die Große Anfrage der Fraktion der SPD', Bundestag Drucksache 10/2543, 30.11.84, p 16
[3] Ulrich Teichler, Dirk Hartung and Reinhard Nuthmann, *Education and the Needs of Society*, (Windsor, NFER Publishing Company Ltd., 1980), pp 76 - 77

higher education institutes which were more practically oriented and adapted to the world of work and science. In order to achieve this, he suggested that the *Hochschulen* work with employers to create suitable courses of study for specific areas of employment. Additionally, he argued the need to improve the effectiveness of scientific studies and contact between higher education institutions through the systematic publication of the results of research projects.[4] The RWTH Aachen, however, provides a fairly typical example of what transpired in practice. Although it claimed to be working toward the creation of more employment-oriented courses "in the sense of a constant adjustment to the position of teaching and learning", there was little appetite for the involvement of industry in the process: "[the courses] should not depend on the selection of … industry". As for an increase in interdisciplinary and/or cooperative research, the RWTH argued that a new organisational form would have to be created in order to finance it, because "there is no classification for such a thing in the budget of the *Technische Hochschule*".[5]

From 346,045 in the winter semester of 1971/72, total student numbers in the FRG rose to 726,900 in 1972/73 and to 946,800 by 1978/79.[6] The process was expedited by the progressive reduction of the number of numerus clausus then in place and the decision to limit its future use in line with a constitutional ruling of 1972 and the conditions of the *Hochschulrahmengesetz* of 1976. Instead, an agreement with the *Kultusminister Konferenz* led to the introduction of an "over-capacity" quota for limited periods in order to satisfy demand in years where a high birth rate had swollen the age cohort.[7] Despite protestations to the contrary and amid mutual recriminations from *Land* and federal authorities, it became obvious both at home and abroad that the system was failing. An OECD review of national policies for education with the German title *"Bildungswesen: mangelhaft"* (Education: unsatisfactory), came to the conclusion that the West German education system as a whole was dangerously backward.[8] More specifically, at the 16th Semestrial Conference of Rectors and vice-Chancellors of the European Universities (CRE), the rector of Mannheim University stated that "the rapid growth of the universities in the sixties and early seventies lowered the standards, measured by any criteria". Much of this he blamed

[4] Letter from Klaus von Dohnanyi to Theodor Heidhues 26. 9.1972 containing 'Vorlage zur 13. Sitzung des Planungsauschusses für den Hochschulbau', pp 4 – 14 in BArch B 247/27
[5] 'Besuch des Wissenschaftrates am 21./22. Juni 1971 in Aachen' pp 1 – 4 in BArch B 247/36
[6] Excerpt from the Wissenschaftsrat's 'Recommendations on the Structure and Extent of Higher Education', Köln, 1978, reprinted as 'Expansion of Higher Education and Employment Opportunities in the Federal Republic of Germany' in *Higher Education in Europe*, Vol.3, No.6, 1.11.78, p 22
[7] Helmut Rohde, excerpt from 'Weitere Öffnung der Hochschule notwendig. 7-Punkte-Programm gegen Zulassungsbeschränkungen' in 'FRG: Government Proposal to limit Numerus Clausus', reprinted in *Higher Education in Europe*, Vol.1, No.3, 1.7.76, pp 23 – 24
[8] OECD, *Education Policies in Perspective: an Appraisal*, (Paris, OECD, 1979), p 63

on the huge increase in the teaching and administrative load of the teaching body which left little time to develop research projects and created "severe role dissatisfaction". He claimed, moreover, that matters had been exacerbated by the issuing of "literally hundreds" of full professorships to junior academics without convincing demonstration of scholarly ability, leading to lowered standards of teaching and research and, because these were lifetime appointments, to a "dead wood problem". Moreover, since the average age of a full professor had fallen from 54 in 1960 to 40 in 1974 and the rate of growth in the numbers of higher education teachers slowed markedly from that point on, the potential existed for the creation of a severe bottle-neck in career prospects for junior academics.[9]

Funding Problems

The rapid expansionist policy brought with it a considerable number of other problems, not least the cost of paying for it given that virtually all higher education institutions were publicly funded. In the two years from 1967 to 1969, funding for higher education had increased by one third (including the building of seven new *Hochschulen* in Bielefeld, Bochum, Bremen, Regensburg, Dortmund, Konstanz and Trier-Kaiserslautern.[10] Numerous hotly-fought battles raged for months on end between the various responsible bodies regarding the amount of new building and equipment required to cope with the expansion. As an example, the *Technische Hochschule* Stuttgart calculated that an increase in ground area from 53,000m² to 88,600m² was required, while the *Wissenschaftsrat*, using what it claimed were "methodologically more robust methods" estimated the necessary figure at only 71,575m². This in turn led to claims from officials of the Ministry for Culture that the lower figure would result in a 20 percent deficit in student places. [11]

Growing concern was expressed at federal government level about the cost of the increasingly rapid expansion at a time when the nation was recovering from a period of economic recession, with Von Dohnanyi referring to it as a financial "Faß ohne Boden"

[9] Rudolph Wildenmann, excerpt from 'Maintaining the Vitality of the University in Matters Concerning the Teaching and Research Personnel', Documents of the 16th session of the CRE Conference DOC 16/7, April 1978, reprinted as 'Situation of Teaching and Research Personnel in the Federal Republic of Germany – Report presented at the CRE Conference', *Higher Education in Europe*, Vo.3, No.3, pp 15 – 17

[10] Statistisches Bundesamt, *Wirtschaft und Statistik*, (Stuttgart und Mainz, W. Kohlhammer GmbH), issue 1971, p 437

[11] 'Vermerk über die 2. Sitzung des Planungsausschusses der BLK am 11.3.1970'; 'Ergebnisprotokoll über die Besprechung der Arbeitsgruppe der Beamten der Kultus- und Finanzministerien der Länder zur Vorbereitung der 3. Sitzung des Planungsausschusses 16.5.1970 in Bonn', in BArch B 304/181/1

(bottomless pit).[12] The effects of the 1973 oil crisis and subsequent deep economic recession, which saw terms of trade worsening by fourteen percent in two years,[13] strained the public purse even further. As a result, in terms of new building and expansion, for which the federal government was jointly responsible, the mid-1970s became a time of virtual stagnation. *Hochschulen* in three *Länder* halved their spending on building, thus reducing their overall costs by 10 – 18 percent. In four others the increase in spending was only between three and five percent with building costs for the engineering sciences suffering particularly badly.[14] Subsequently, the federal contribution towards the co-financing of the higher education building programme showed a progressive fall from 1,015 million DM in 1978 to a low of 797.8 million DM in 1981 until the newly elected CDU administration began raising the amount again in 1982. Nevertheless, despite the ongoing expansion, it would be 1985 before building programme funding recovered to its 1978 level.[15] As student numbers continued to climb steadily throughout the 1970s, the implications in terms of overcrowding and for the quality of teaching and research are obvious.

The financial situation was exacerbated by the requirement to pay student support, the main artery for which was the *Bundesausbildungsförderungsgesetz* (*Bafög*). Introduced in 1971, it was intended to provide a more equal chance for higher education among the lower and middle classes who might otherwise have been excluded on the grounds of cost. 65 percent of the *Bafög*, which covered living costs and tuition fees, was paid for by federal government and 35 percent by the *Länder*. Joint costs amounted to around 1.6 billion DM for 493,000 students in 1972, 2.6 billion DM for 665,000 students in 1975 and 3.7 billion DM for 830,000 students in 1980. The more meagre financial help for doctoral students, which reached its height at 61 million DM in 1975, was issued in the form of a loan from 1976 onwards, following which applications for postgraduate funding dropped sharply.[16]

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[12] Klaus von Dohnanyi, 'Vorlage zur 13. Sitzung des Planungsauschusses für den Hochschulbau des Wissenschaftsrates am 23.10.1972', in BArch B 247/27

[13] Herbert Giersch, Karl-Heinz Pacqué and Holger Schmieding, *The Fading Miracle: Four decades of market economy in Germany*, (Cambridge, CUP, 1992), p 186

[14] Statistisches Bundesamt, *Wirtschaft und Statistik*, issue 1977, p 486

[15] Bundesminister für Bildung und Wissenschaft, 'Antwort auf die Große Anfrage der Fraktion der SPD', 30.11.1984, Bundestag Drucksache 10/2543, p 4

[16] Bundesregierung, 'Entwurf der Fortschreibung des Bildungsgesamtplans, Stand: März 1981', Bundestag Drucksache 9/2012, pp 99 – 100

On a different tack, the *Bund-Länder Kommission für Bildungsplanung und Forschungsförderung* (BLK)[17] highlighted the economic effects of the expansion of higher education on the structure of labour market. It projected that the increased numbers attending *Hochschulen* would mean a loss from the workforce of over 600,000 employees up to the year 1985. This, in turn, would affect industrial production and lead to a slowing of economic growth and hence of public revenue in the short to medium term, although there would ultimately be long-term economic benefits to the country in terms of the increased productivity which would arise from the general raising of the education level of workforce.[18]

Course Selection

In addition to the pressure on finances, accommodation and the teaching body, the expansion policy also inevitably led to an inability to provide all students with their preferred course of study. There were a number of reasons for this. Firstly, the education reform of the 1960s had led to the creation of around twenty different types of *Gymnasien* and a system of special course choice in upper secondary level education which greatly increased the numbers of *Abiturienten* equipped only to study what were considered the 'soft options' of philosophy and the humanities, as opposed to more rigorous scientific disciplines.[19] Additionally, a somewhat equivocal ruling from the Federal Constitutional Court in 1972 stated that the existing use of entry restrictions to tailor higher education admission to conform to labour market demand was incompatible with the constitution except under very specific circumstances.[20] The *Hochschulrahmengesetz* of 1976 further constrained the educational authorities to severely limit the use of entry restrictions with the result that by 1980 only eleven courses (among them medicine, dentistry and electrotechnology) were subject to a numerus clausus restriction to fit with predicted demand levels, in comparison with the 56 which existed in 1976.[21] The apparent reasoning behind this decision was partly because competition for places in the highly popular numerus clausus subjects was considered to impose too much strain on young minds and partly because their removal would enhance the educational chances of those "belonging to

[17] Organisation founded in 1970 as a discussion forum for all questions related to education and research with the power to make recommendations to the heads of federal and Land governments
[18] 'Errichtung einer Bund/Länder Bildungsplanungskommission (BLK) – 2. Entwurf des Bildungsgesamtplanes Teil II April 1971', section IV.2, in BArch B 304/172/6
[19] Matthias M. Heister, 'Notes on Current Planning for Higher Education in the Federal Republic of Germany', *Oxford Review of Education*, Vol.11, No.3, 1985, p 256
[20] Teichler et al., *Higher Education and the Needs of Society*, p 22
[21] 'Fragen zur Entwicklung des Hochschulbereichs, 27.08.80, Bundestag Drucksache 8/4459, p 2

the demographic heap [sic]".[22] Applications for many courses, therefore, frequently exceeded available capacity and a considerable number of students were forced to study a second choice subject.

Related to this was a second reason: the steadily increasing tendency for students to extend the length of their study period well beyond the minimum, leading to bottlenecks in a number of subjects. As an example, with an 'overlong' study period defined as being four semesters or more over the minimum necessary, in the University of Frankfurt 18.4 percent of chemistry students, 14.3 of sociology and politics students and 13.7 of biology/geosciences students over-extended their period of study.[23] Between 1979 and 1982, the average age of a university graduate had increased by 0.3 years to 27.3 years and the average duration of a first degree was 11.4 semesters.[24] Von Dohnanyi argued on behalf of the federal government that the constitutional guarantee of 'freedom of teaching' did not excuse higher education teaching staff and faculties from the need to so construct courses of study that students could not exceed the standard study period, nor did 'freedom of study' permit students to neglect and draw out the duration of study to the detriment of other applicants.[25] Reasons for extended periods of study included changing courses mid-stream; staying on to take a second undergraduate degree, sometimes as a result of entry restrictions on first choice and changes in the curriculum which increased the compulsory duration of many courses. However, it has also been suggested that in a time of greater uncertainty regarding employment, for many students the idea of remaining at university as long as possible was a means of 'putting off the evil day' or buying time while looking for suitable employment.[26] Improved student guidance to preclude this situation had been a federal government priority from the beginning of the 1970s. Nevertheless, by 1978 there still existed only one advisor per 5,000 students nationally. Their work consisted of advising on courses and forms of study, but they were also required to counsel students with learning and behavioural problems. There were, moreover, considerable regional differences in provision between *Länder*; waiting times for guidance interviews were frequently very long; there was a lack of suitably qualified personnel to undertake the task;

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[22] Christoph Oehler and Ulrich Teichler, 'Changing Approaches to Planning in Higher Education in the Federal Republic of Germany', *Higher Education in Europe*, Vol.9, No.1, 1.1.84, p 16

[23] 'Antwort des Kultusministers auf die kleine Anfrage des Abgeordnete Dr. Brauns (FDP), Hessischer Landtag', 25.7.1974, p 2, in BArch B 304/91/2

[24] Statistisches Bundesamt, *Wirtschaft und Statistik*, issue 1984, p 278

[25] Letter from Klaus von Dohnanyi to Theodor Heidhues 26. 9.1972, pp 4 – 5

[26] Peisert, 'Students in the Federal Republic of Germany: Diversity in Motives and Prospects', *Higher Education in Europe*, Vol.10, No.1, 1.1.85, p 20

and all the offices were characterised by high staff turnover resulting in a generally inefficient service.[27]

Graduate Employability

In 1974 a meeting of the *Unterausschuss für quantitative Berechnungen* of the KMK reported that "the number of cases of those graduates who are difficult to employ is piling up". Apart from the effects of the general economic downturn, there appeared to be two main reasons for this. The first was an increasingly obvious discrepancy between the traditional humanities courses preferred by the majority of students in the *Hochschulen* and the changing demands of the employment market.[28] Schramm has argued that this was an issue which had been largely neglected and that the vast majority of students were receiving the same sort of academic training for employment as had existed for the previous 200 years. Nor were market conditions influencing the type of employment which students saw as consistent with higher-level qualifications.[29] An enquiry by federal government reported that many of the existing courses of study lacked a manageable structure, had insufficiently defined educational goals and lacked both diversity of content and clear links to fields of employment. The government therefore demanded that courses be better oriented towards new developments in science, technology and to the working environment, taking new employment areas into consideration even if they crossed the traditional boundaries of subject disciplines, something the different faculties and departments of the *Hochschulen* appeared to find difficult to reconcile with traditional departmental, facultative and institutional autonomy.[30] Additionally, it reiterated, yet again, the need for *Hochschulen* to initiate a continuous dialogue with state bodies and the employers in order to address the imbalance between graduate qualifications, acquired skill levels and the labour market.[31]

The second reason was that serious impasses were appearing on the employment market as rising numbers of graduates competed for work. Graduate employment expectations did not appear to have changed substantially despite the changing economic and technological

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[27], 'Entwurf der Fortschreibung des Bildungsgesamtplans, Stand: März 1981', Bundestag Drucksache 9/2012, pp 107 – 108

[28] Eckstein, 'Ergebnisniederschrift über die 38. Sitzung des Unterausschusses für quantitative Berechnungen im Hochschulbereich am 27. September 1974', pp 3 – 4, in BArch B 304/91/2

[29] Jürgen Schramm, 'Development of Higher Education and Employment in the Federal Republic of Germany', *Higher Education*, Vol.9, No.5, Sept. 1980, pp 608 – 612

[30] See for example, 'Fragen zur Entwicklung des Hochschulbereichs', 27.08.80, Bundestag Drucksache 8/4459, p 30

[31] 'Entwurf der Fortschreibung des Bildungsgesamtplans', 1.10.82, Bundestag Drucksache 9/2021, pp 19 – 22

climate. Unsurprisingly, in view of the prolonged national shortage, still one of the most popular study options in the early 1970s was teacher training, which in 1971 was the choice of an impressive 39.1 percent of all *Abiturienten* (28.7 percent of males and 56.6 percent of females). This was despite the warnings of the BLK that falling school rolls would rapidly result in a national over-supply of teachers.[32] Interest in teaching did begin to show a decline as the decade progressed; however, between 1975 and 1985, the number of successful teaching graduates who were unable to find a teaching post of any sort had risen to 65,000 of whom 25,000 were still on the unemployment register in 1985.[33] Teaching aside, between 1966 and 1976 the number of graduates in medicine increased by one third; in engineering science by fifty percent; in economics and social sciences by two hundred percent; in the humanities by five hundred percent; and in mathematics and the natural sciences by seven hundred percent. These latter two groups accounted for 75 percent of all degree exams passed in 1976 compared to 45 percent in 1967. The total figures are as follows:

Table 5.1

University and Fachhochschule diplomas achieved in West Germany 1976

Subject Area*	Number
Humanities	57,280
Mathematics and Natural Sciences	26,442
Economics and Social Sciences	18,434
Medicine and Veterinary Medicine	7,008
Engineering Sciences	8,485
Total	**119,820**

* From 1973 all teaching qualification exams were included in those figures for the appropriate subject area

Source: Statistisches Bundesamt, *Wirtschaft und Statistik*, issue 1977, p 795

Hence, around half of all students in the FRG graduated in the humanities. This picture remained consistent until the 1980s although the number of degrees awarded in both the humanities and the natural sciences decreased slightly, while those in economics and the social sciences slowly increased. The motives for students' choice of subject, however, were not always clear although Sandberger and Lind's 1969 – 1976 study appeared to

[32] *Wirtschaft und Statistik*, issue 1971, p 611
[33] Heister, 'Notes on Current Planning for Higher Education in the Federal Republic of Germany', pp 258 - 259

show that students continued to rate development of the personality as considerably more important than either enhancement of social status or professional career motives.[34]

By 1978 the *Wissenschaftsrat* was reporting saturation in some areas of the labour market, most particularly in the civil service which had traditionally absorbed two thirds of all new graduates (90 percent of these in the areas of education, science and the arts). Moreover, the number of 'graduate-equivalent' positions in the economy was also expected to decrease rather than increase in the medium to long term. This was in part because of the general economic trend, but also because the majority of graduate jobs took the form of long-term, often life-time, employment contracts which had the effect of reducing turnover, particularly in a relatively young workforce.[35] A study carried out by the *Institut der deutschen Wirtschaft* (German Economic Institute) in 1978 found that although around 88 percent of graduates did manage to find employment appropriate for their qualification level, many had to wait a considerable time to get it.[36] This depended, though, on the type of graduate. The number of registered unemployed engineers, chemists, physicists and mathematicians, reached a height of 16,430 in 1976 then fell to a low of 8,386 in 1980, although it rose to stabilise in the mid-11,000s thereafter.[37] In general, however, the total number of unemployed *Hochschule* graduates demonstrated a tenfold increase from around 10,000 in 1973 to over 100,000 in 1983.[38] Unemployment among *Fachhochschule* graduates was lower, although again this varied by type of qualification with social sciences graduates suffering particularly badly.[39] These figures were set against the background of a sharp increase in unemployment figures nationally between 1972 and 1975 from around 246,000 (1.1 percent of the working population) to around 1,074,000 (4.7 percent), although the level then stabilised and showed a slight downturn until 1980 (ca. 888,900) before increasing again (ca. 1,271,600 or 5.5 percent in 1981 and ca.1,833,200 or 9.1 percent in 1982).[40] Proportionately, therefore, the graduate unemployment rate was worse than the general rate (an increase of less than 7.5 fold) between 1972/73 and 1982/83 and had maintained an increasing trend during the second half of the 1970s even during a period when the national rate of unemployment had

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[34] Johann-Ulrich Sandberger and Georg Lind, 'The outcomes of university education: some empirical findings on aims and expectations in the Federal Republic of Germany', *Higher Education*, Vol. 8, 1979, pp 179 - 183

[35] Wissenschaftsrat, excerpt from 'Recommendations on the Structure and Extent of Higher Education', pp 25 – 27

[36] Ulrich Teichler and Bikas C.Sanyal, *Higher education and the labour market in the Federal Republic of Germany*, (Paris, Unesco Press, 1982), p 36

[37] Statistisches Bundesamt, *Wirtschaft und Statistik*, issue 1981, p 81

[38] Peisert, 'Students in the Federal Republic of Germany: Diversity in Motives and Prospects', p 19

[39] Gieseke, 'The "Fachhochschulen" in the Federal Republic of Germany', p 45

[40] Statistisches Bundesamt, *Wirtschaft und Statistik*, issue 1976 p 528; 1990 p 159

stabilised. In absolute numbers, however, the burden of unemployment fell overwhelmingly on lower- and unskilled workers.

Manpower requirement studies commissioned by the federal government predicted that economics, law and sociology graduates were less likely to be badly affected due to the greater flexibility of employment afforded by their training; nevertheless, a surplus of ten to fifteen percent of graduates in these disciplines was expected by the mid-1980s. As has been highlighted previously, however, the accuracy of manpower forecasts was very debatable. The same studies also predicted an over-supply of engineers and natural scientists. As an example, despite the introduction of a numerus clausus on electrotechnology in 1971/72, a 1975 report indicated that there were two percent more graduates in electrotechnology than vacancies for them and that this was expected to increase to around twenty percent by 1990.[41] In 1979, however, the Association of German Electro-Engineers was forced to completely reverse this assessment when a study based on the enrolment figures for 1979 indicated an alarming decline in enrolment for electronic engineering at a time when industry was demanding hugely increased numbers.[42] Nevertheless, as *Bundeskanzler* Helmut Schmidt emphasised in 1977, such was the employment situation that it was obvious that academic studies no longer guaranteed graduates a high level professional career or even a higher salary than that of a skilled factory worker.[43]

Government Initiatives

A number of measures were initiated in order to address both the problem of overcrowding in the *Hochschulen* and the shortage of professional vocational training. One, based on a recommendation from the *Deutscher Verband Technisch-Wissenschaftlicher Vereine* (German Association of Technological and Scientific Organisations), was the elevation of existing *Fachhochschulen*[44] to the higher education sector, thus creating two study options at the higher level. These 'enhanced' *Fachhochschulen* would offer tightly managed

[41] Bundesministerium für Bildung und Wissenschaft, excerpt from 'Bildungspolitische Zwischenbilanz' in 'Employment Prospects for Higher Education Graduates in FRG', reprinted in *Higher Education in Europe*, Vol.1, No.2, 1.3.77, pp 12 – 14

[42] Gerard Hughes, *Manpower Forecasting: A Review of Methods and Practice in Some OECD Countries*, (Dublin, The Economic and Social Research Institute, 1991), p 65

[43] Helmut Schmidt, excerpt from opening speech at the beginning of the new legislature of the Bundestag, reprinted as 'Higher Education Policy of the New Government of the Federal Republic of Germany, *Higher Education in Europe*, Vol.2, No.1, 1.1.77, p 18

[44] Polytechnic level institutions

courses of study of a fixed length (three and a half years) which would be much more strongly oriented to the specific demands of industry, while study in the *Hochschulen* would remain more theoretical and research-oriented. Despite strenuous resistance from academia and others who regarded this as "academic drift",[45] the dual system was introduced in 1971 resulting in a 34.9 percent rise in numbers studying at *Fachhochschulen* between 1974 and 1980. The most popular courses were the engineering sciences. Over the period 1971 – 1981, around 41.3 percent of students studied mechanical/process engineering, electrotechnology, architecture/internal architecture and construction engineering. Around fourteen percent chose social studies and 9.1 percent economics. A further ten percent opted for the newly created *Verwaltungsfachhochschulen* or *Beamtenfachhochschulen* (administration or civil service colleges) which trained students specifically for work in the civil service. [46]

By 1981 Ludwig Gieseke of the *Bundesministerium für Bildung und Wissenschaft* could report that at least 30 percent of the student intake of the *Fachhochschulen* consisted of *Abiturienten*.[47] However, despite the introduction of heightened entry qualifications and more flexible study options, the *Fachhochschulen* never quite managed to escape the stigma of institutional hierarchy, nor were employers willing to pay the same salaries to graduates of *Fachhochschulen* as to *Hochschule* graduates. *Hochschule* engineering graduates, for instance, started their careers at salary levels which the *Fachhochschule* graduates could generally only hope to be earning by the end of theirs.[48] Additionally, the continuing perception of greater social cachet in graduating from *Hochschule* resulted in many students looking on graduation from the *Fachhochschule* simply as an alternative route to gain admission there. The proportion of *Fachhochschulen* graduates who made this transition in 1975 ranged from around ten percent in Bavaria to around 30 percent in Nordrhein-Westfalen. This presented more of a worry to some *Länder* than others; for example there was a serious lack of available student places in Ost Bayern.[49] Suggestions that this option should be made more difficult, however, ran up against the argument that this would simply increase the numbers applying directly to the *Hochschulen*.[50]

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[45] Oehler and Teichler, 'Changing Approaches to Planning in Higher Education in the Federal Republic of Germany', p 15
[46] Statistisches Bundesamt, *Wirtschaft und Statistik*, issues 1980 p 263; 1981 p 730
[47] Gieseke, 'The "Fachhochschulen" in the Federal Republic of Germany', p 44
[48] Conrad, 'Schriftliche Fragen mit den in der Woche vom 9. April 1984 eingegangenen Antworten der Bundesregierung' 13.4.84, in Bundestag Drucksache 10/1326
[49] 'Stand der Maßnahmen nach Länderangaben (Ziffern entsprechen dem 4. Rahmenplan) in Tischvorlage zur Sitzung der Arbeitsgruppe Kapazitätsfragen am 1. Juli 1975 in Bonn', pp 3 – 16, in BArch B 304/858; Jobst, 'Frage für die Fragestunden der Sitzungen des Deutschen Bundestages' 12.4.78, Bundestag Drucksache 8/1689
[50] Teichler et al., *Higher Education and the Needs of Society*, pp 111 – 114

Another government initiative involved the attempted conversion of all *Hochschulen* to become *Gesamthochschulen* (comprehensive universities covering both university level and non-university level higher education, offering part- or fully-integrated courses for student groups at both levels and facilitating easier transfer between the two). The introduction of these, however, proved extremely difficult with most of the institutions concerned raising so many logistical and technical objections that the effort was usually abandoned. For example, the attempt at the RWTH Aachen was undone by the insistence of all three institutions concerned (the RWTH Aachen, the *Pädogogische Hochschule* and the *Fachhochschule*) on the maintenance of their individual institutional identities within a cooperative rather than an integrated structure. The *Pädogogische Hochschule* also refused to cooperate altogether unless the representation of all three institutions on the ruling Senate was equal, something considered infeasible by the *Technische Hochschule* in view of the difference in size of the institutions and the lack of experience of the others in the running of a large, university-level organisation. Other fundamental disagreements as to the type of teaching staff required, course design and examination timetabling were compounded by insufficient funding to build more accommodation for the vastly increased numbers of students expected and the effort was ultimately aborted.[51] There were some successes nevertheless, and the number of *Gesamthochschulen* nationally reached a maximum of eleven from 1975 – 1980. They never quite achieved the goals envisaged for them, however, and did not have much of an impact on the numbers of students opting for more traditional *Hochschulen* as the following table demonstrates:

Table 5.2

Percentage of student beginners West Germany 1977/78 – 1981/82 by type of institution

Year	Hochschule	Fach-hochschule	Gesamt-hochschule	Pädagogische Hochschule[1]	Other[2]
1977/78	66.6	17.7	5.4	8.4	1.9
1978/79	67.5	18.2	6.5	5.8	1.9
1979/80	67.5	18.4	6.8	5.3	1.9
1980/81	71.0	16.5	6.4	1.7	2.0
1981/82	69.7	17.1	6.7	1.7	1.9

[1]Very few Pädogogische Hochschule were stand-alone entities. Most were incorporated either into Hochschule or Gesamthochschulen
[2]Kunsthochschulen and Theologische Hochschulen

Source: *Wirtschaft und Statistik*, issues 1977 p 595; 1979 p 276; 1980 p 262; 1981 p 733; 1982 p 379

[51] 'Vermerk über die Ergebnisse der Begehung bei der Technischen Hochschule Aachen am 21. und 22. Juni 1971', in BArch B 247/36 pp 3 – 5

Moreover, the number of *Gesamthochschulen* was progressively eroded over several years as the individual institutions comprising them individually sought re-classification to full university status, as reported in successive issues of the statistical journal.[52]

A further policy initiative was the extension of the programme of *Weiterbildung* (continuing education) and professional development courses primarily to counter the difficulties of keeping professionals abreast of rapid technological change. The concept was particularly important for the small and medium enterprises which had limited resources of their own for the training of staff. It was also seen as a means of promoting a symbiotic relationship between the academic and the wider community, improving links between the two and countering public perception of higher education as alienated from pressing social problems.[53] The *Hochschulen,* however, appeared to experience great difficulty in the planning and execution of these courses. Part of the problem lay in the specifically professionally oriented nature of the courses which were very different from the traditional courses offered by the *Hochschulen.* In 1980, for example, of all the courses offered as part of the programme, only 27 percent could be delivered directly from existing curricula and a further 23 percent had to be developed from scratch. Moreover, the course material required continual up-dating in order to remain current. Other problems encountered were that many *Hochschulen* simply refused to participate. Of those which did, some demonstrated very individual interpretations of the concept of continuing education, offering courses which were unlikely to "enrich, modernise or render more flexible the traditional contents of higher learning".[54] Overall, the volume of continuing education offered was tiny in comparison with the amount of courses offered outwith *Hochschulen* which were sponsored by industry, various administrative bodies, trade-unions and private education associations. These, however, were frequently offered only to upper level professionals including medical doctors, economists, judges, lawyers and attorneys as well as engineers and scientists.[55] From the perspective of the *Hochschulen*, however, there is no doubt that the professoriate felt that its already heavy teaching and administrative load was simply exacerbated by the extra commitment which was not accompanied by a corresponding extension of facilities or teaching personnel. Moreover,

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[52] See for example, *Wirtschaft und Statistik*, issue 1977, p 485; 1980, p 716; 1981, p 733; 1982, p 268
[53] Oliver Fulton, 'Needs, Expectations and Responses: New Pressures on Higher Education', *Higher Education*, Vol.13, No.2, April 1984, p 198
[54] Jürgen Allesch, 'Analysis and Perspectives of Academic Continuing Education courses in the Federal Republic of Germany', *Higher Education in Europe*, Vol. 6, No. 4, 1.10.1981, p 20
[55] Allesch, 'Analysis and Perspectives of Academic Continuing Education courses in the Federal Republic of Germany', pp 18 – 19

the increasing pressure on time caused by the teaching load resulted in a corresponding restriction in the amount of time available for research.

Despite the fact that there was obviously a decisive move to obtain 'more employable' qualifications in an alternative institutional setting, most particularly the *Fachhochschulen*, the somewhat limited success of the measures outlined above can be seen as continued evidence of resistance to change. However, this manifested itself not only in the reluctance of academic circles to embrace organisational and structural change and in the protracted negotiations required at all levels to institute changes in higher education; it also existed in the mindset of the students, employers and of the German populace in terms of the level of regard in which they held the different forms of academic study and the perception of the financial and social benefits to be had from acquiring a degree in a *Hochschule* as opposed to from any other source.

1980s

Changing Trends

By 1981, nevertheless, a changing trend was becoming evident in the subject choices of *Abiturienten*. The numbers opting for the arts and humanities were beginning to decrease; conversely the numbers choosing economics, social sciences and, most particularly, engineering sciences were beginning to climb, as demonstrated by the following table:

Table 5.3

Desired course of study in West German Hochschulen by subject area 1972 – 1981

Subject area	1972	1980	1981
Engineering	19.1%	21.6%	22.3%
Economics and Social Sciences	21.1%	21.6%	21.6%
Languages and Humanities	20.5%	15.9%	15.7%
Maths and Natural Sciences	17.6%	13.4%	13.0%
Art, Aesthetics and Art History	4.3%	6.9%	7.2%
Human Medicine	7.9%	6.2%	6.4%
Agriculture, Forestry and Dietetics	1.9%	5.0%	4.8%
Sport and Sport Science	2.3%	1.9%	1.7%
Veterinary Medicine	0.4%	1.0%	6.3%
Not stated	4.9%	6.4%	6.3%

Source: Statistisches Bundesamt, *Wirtschaft und Statistik*, 1981, p 730

In the *Fachhochschulen*, the engineering sciences remained by far the most popular option (41.3 percent) with students choosing to study mechanical/process engineering, electrotechnology, architecture/internal architecture and construction engineering. The next most popular options were social studies (14 percent) and economics (9.1 percent).[56]

By 1985, there was a visible decline in interest in the humanities among student beginners in both *Hochschulen* and *Fachhochschulen*, although they still remained by far the preferred option of female students (33.5 percent). Engineering sciences were the first choice of the males (28.8 percent), with much of the rapid growth of interest in these from 1980 – 1985 due to a strong expansion of the *Fachhochschulen* where the shorter and more employment-oriented nature of the courses were more attractive from the point of view of finding employment afterwards. The least popular options were mathematics and the natural sciences with 17 percent of males and 13.1 percent of females enrolling for these.[57] In part at least, this was due to a decline in interest in teaching as a career, and in part because of the relatively problem-free access to study engineering sciences and the multiple employment possibilities offered by these courses. The change also reflects a realisation of the changed economic and employment situation in West Germany and a much more pragmatic approach to higher education. Not only were the traditional graduate employment opportunities narrowing, following the two oil crises of 1973 and 1979 higher levels of unemployment had become a permanent feature of the West German economy. Additionally, technology, especially in the form of microelectronics, was transforming virtually all sectors of the economy. Thus, it was seen as offering new, exciting and financially lucrative career prospects as well as the best chance of secure employment at graduate level.

At the same time, proportionately fewer *Abiturienten* were expressing the desire to study at either *Fachhochschule* or *Hochschule* level.[58] From a figure of 87.2 percent in 1970, this had fallen to 68.7 percent in 1981, 62.5 percent in 1983 and 59.2 percent in 1984. Moreover, there was a proportionately much greater decline in interest among those possessing a *Hochschulreife* as opposed to those with a *Fachhochschulreife*. Nevertheless, despite this picture of falling interest, the numbers actually undertaking study at a higher level consistently exceeded the numbers stating their willingness to do as demonstrated by Figure 5.1:

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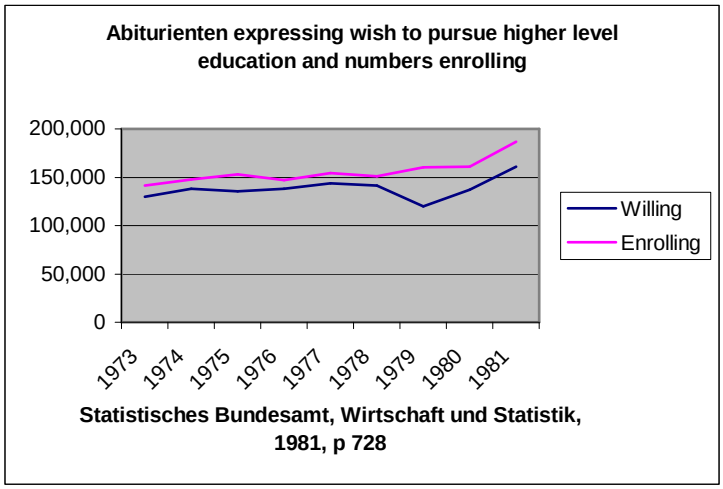
[56] Statistisches Bundesamt, *Wirtschaft und Statistik*, 1981, p 730
[57] Statistisches Bundesamt, *Wirtschaft und Statistik*, 1981, p 730; 1985, pp 392 - 393
[58] See Bikas C. Sanyal, 'Higher Education and Employment in Europe: Some Selected Issues', p 46 and Peisert, 'Students in the Federal Republic of Germany: Diversity in Motives and Prospects', pp 20 – 22

Figure 5.1



The rising absolute numbers are the consequence of the demographic increase in the relevant age cohorts. Student numbers continued to climb from 1,008,000 in 1981 to over 1.5 million in 1989.[59] Peisert makes the point, however, that in 1983 at least five percent of those enrolling in *Hochschule* did so "faute de mieux" because there were insufficient places available in the lower level vocational training establishments.[60] This would appear to be confirmed by a report from the *Bundesministerium für Bildung und Wissenschaft* (BMBW) which stated that rapidly increasing numbers of those qualified for higher education were opting for employment training instead, demonstrating a "more realistic assessment of the rapidly worsening employment prospects for graduates", and welcoming the trend despite the strain this placed on existing facilities. In language eerily reminiscent of that of the Honeckers in East Germany in 1971, the BMBW stated that the overvaluation of higher level education as opposed to employment training in the past had led to the unbalanced development of educational and labour market policy. As a result, graduates, who had formed one-sixth of the workforce in 1982, were expected to constitute one third of it by the early 1990s. The need for the future, therefore, was to concentrate educational policy on producing the type of manpower needed by the economy, which all the

[59] Longitudinal study commissioned by the SKKL and the *Bundesministerium für Bildung und Wirtschaft* conducted from the winter semester of 1970/71 onwards with a 96 – 98 percent return figure for the questionnaires used in the study. Statistisches Bundesamt, *Wirtschaft und Statistik*, 1975, p 535; 1981, pp 727, 733; 1984, p 1025; 1989, p 346

[60] Peisert, 'Students in the Federal Republic of Germany: Diversity in Motives and Prospects', p 19

manpower prognoses of the time stated unequivocally was for far more skilled workers than graduates.[61]

Nonetheless, by 1987 there were roughly 1,806,000 *Hochschule* graduates and 976,000 *Fachhochschule* graduates forming 10.3 percent of the workforce compared to 3.8 percent in 1970.[62] A comparison of the unemployment figures for 1976 and 1987 reveals that unemployment levels of *Fachhochschule* graduates rose from 1.7 to 1.8 percent and those of *Hochschule* graduates from 2.3 to 3.4 percent. This, however, was in the context of an increase in total unemployment from around 944,000 (4.6 percent) to around 2,376,000 (7.9 percent), the major proportion of which (70.4 percent) consisted of those with minimal or no post-compulsory education or training. The lower unemployment rate for *Fachhochschule* compared to *Hochschule* graduates appears to confirm that the more practical nature of the *Fachhochschule* courses led to better employment prospects. Statistics also show that unemployment was generally much higher among women than men and that this was particularly noticeable at the upper end of the educational spectrum.[63] Women had much greater difficulty in finding suitable first positions after graduation than men and this increased over time. It may be partially explained by the propensity among women to study the humanities instead of more specifically professionally-oriented courses, but also reflected a prevalent and persistent trend of prejudice against women in the competition for jobs and the tendency for the female half of a partnership to tolerate career disadvantages when family duties intervened.[64]

According to human capital development theory, the employment market should be capable of absorbing increasing numbers with progressively higher levels of qualification and to some extent at least, this appeared to be happening. A small but growing proportion of graduates was taking over positions previously held by non-graduates, confirming that some measure of 'skills bumping' was taking place and shifting the burden of unemployment towards the lower end of the labour market.[65] As well as being responsible for the general upskilling of the West German workforce, therefore, the expansion of

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[61] 'Bericht der Bundesregierung: "Hochschulpolitische Zielsetzungen der bundesregierung und Förderung der Drittmittelforschung"', 4.9.85, Drucksache 10/3782, p 5
[62] Teichler et al., *Higher Education and the Needs of Society*, p 25
[63] Statistisches Bundesamt, *Wirtschaft und Statistik*, issue 1989, pp 66 – 67; p 69
[64] Christine Schmarsow, 'Women in Higher Education – some information on the situation in the Federal Republic of Germany', *Higher Education in Europe*, Vol.6, no.4, 1.10.81, pp 53 – 54
[65] Teichler and Sanyal, *Higher Education and the Labour Market in the Federal Republic of Germany,* p 36

higher education seemed to have led to some measure of qualifications inflation whilst managing to absorb the greater majority of graduates produced.[66]

Reform Initiatives

Because it was constitutionally unable to actively reduce *Hochschule* recruitment, the aim of the CDU/CSU-led administration which had come to power in 1982, was to force the higher education system to make the necessary structural and qualitative changes needed to cope with the quantitative expansion and to develop closer links with the employment system.[67] Moreover, the BMBW continually emphasised the growing need for *Hochschulen* to synchronise their teaching and research goals with the rapid development in many scientific areas in order to keep abreast of ever-intensifying global competition. At the same time, the increasing costs of doing this had to somehow be reconciled with the limited funding available. Laitko has highlighted the level of interest expressed by the FRG in the Third Higher Education Reform Bill passed in East Germany, and in particular, its emphasis on science as the means of developing innovations for use in the economy and the wider society.[68]

Academic Competition and Profiling

The parallels between the Third Reform Bill and some of the new policy initiatives announced by the West German federal government are astonishing. In a strong echo of the GDR's Third Reform Bill, the 1982 report on target setting for higher education of the new CDU/CSU/FDP government stated that intensification and rationalisation was to be achieved through the introduction of the principles of competition and differentiation between the individual institutions in the form of profiling.

Competition, based on generally recognised (if then still undetermined) standards for the assessment of performance in teaching and research, was envisaged as taking place between individual institutions, professors and students and even between *Länder*. The competition for individual professors as a means of raising the quality of education,

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[66] Joan Muysken, Hannah Kiiver and Mombert Hoppe, 'The Impact of Education and Mismatch on Wages: Germany, 1984 – 2000', in *Overeducation in Europe: Current Issues in Theory and Policy*, p 111 - 115

[67] 'Bericht der Bundesregierung:"Hochschulpolitische Zielsetzungen der Bundesregierung und Förderung der Drittmittelforschung"', 4.9.85, Bundestag Drucksache 10/3782, p 5

[68] Hubert Laitko, 'The Reform Package of the 1960s', in Kristie Macrakis and Dieter Hoffman (eds), *Science under Socialism: East Germany in Comparative Perspective*, (Cambridge Mass., Harvard University Press, 1999), p 57

training and research as well as for research funding was seen as particularly significant, as was the ability to compete for students in the longer term. The removal of the function of the central distribution office in allocating students to *Hochschulen* would have the double benefit of allowing students a freer choice of institution and individual *Hochschulen* the right to decide which students to accept, based on their ability and on the institution's educational and research profile. There was, moreover, encouragement for sponsorship in the form of privately funded research institutes or professorial chairs which would increase the income of *Hochschulen* and encourage new fields of research. The ministry suggested that an extension of the number and type of courses offered by the *Fachhochschulen* was necessary to reflect new developments in the field of employment and that these should include some entirely new areas of study. In addition, students in *Fachhochschulen* should be offered more choice in the structure of courses, including part-time study and enhanced cooperation with industry. New initiatives were to be developed, including the development of longer periods of practical training within firms, leading to a qualification which would be more attractive to both candidates and employers because of its more practical orientation. The position and status of the *Fachhochschulen* vis-à-vis the rest of academia was also to be strengthened through greater representation on educational bodies. Thus, through this and a more comprehensive, practical educational and research profile, they would be in a better position to compete with *Hochschulen* for funding, personnel and students. Additionally, the new government actively welcomed competition in the form of privately run *Hochschulen*, on the grounds that these could be run with greater flexibility than state institutions and thus might stimulate new forms of teaching and learning and develop new economic solutions.

Institutional differentiation was to take the form of the creation of individual institutional profiles for teaching and most especially for postgraduate opportunities and research through the development of centres of excellence and the pursuit of special research foci (*Schwerpunkte*) in particular subject areas. Other facets were to include the strengthening of the links between the *Hochschulen* and the industry and services in their immediate geographical regions; interdisciplinary and inter-*Hochschulen* cooperation in specific areas of research; the development of thematically defined research centres; and cooperation with research institutions outwith the *Hochschulen* and with 'third-party' organisations such as government departments and external foundations which financed research (*Drittmittelforschungsförderung*).[69] The *Deutsche Forschungsgemeinschaft* had already

[69] 'Bericht der Bundesregierung: "Hochschulpolitische Zielsetzungen der Bundesregierung und Förderung der Drittmittelforschung"', 1982, pp 1 – 2; 9 – 10

been involved in promoting a number of priority programmes involving cooperative research between researchers from several different *Hochschulen* while the *Wissenschaftsrat* had instituted a series of "Special Collaborative Programmes" involving scientists from different disciplines in one university collaborating on interdisciplinary projects, of which over one hundred were running by 1981.[70] The aim of the schemes was, at least in part, to defray the heavy costs of replacing research machinery and equipment with an increasingly short technical shelf-life (such as nuclear research reactors or computer equipment) through its more intensive use within the *Hochschulen* and indeed by several *Hochschulen*.[71] Additionally, new forms of teaching, cooperative research and student and staff exchanges with foreign academic institutions, and much more intensive cooperation with the economy in the area of knowledge and technology transfer were to be developed.

Technology Transfer

In complete contrast to the GDR was the almost exclusive focus on basic research in the FRG's *Hochschulen*. Technology transfer, particularly from the *Hochschulen* to the market, was an area of particular concern to the federal government because of the implications for the promotion of innovation and enhanced economic growth. This became particularly important as West Germany, in order to boost its international competitiveness, moved towards the more flexible and specialised production of customised goods in the 1980s, many of them using sophisticated microprocessor technologies. Moreover, increased flexibility demanded more technological sophistication, not only in product development but also in finding ways to cut the costs of customised production.[72] Numerous efforts to promote better technology transfer had been initiated variously by the federal Ministry for Education and Science, Research and Technology, the Ministry for the Economy and the Ministers for Science and for the Economy of the *Länder*. These had two main purposes. One was aimed at tackling the lack of communication and interaction between the *Hochschulen* and key production centres of the economy which was leading industry to display an increasing lack of confidence in higher

[70] Valentin von Massow, 'Organization and Promotion of Research (in particular, University Research) in the Federal Republic of Germany', *Higher Education in Europe*, Vol. 6, No.2, 1.4.81, p 15
[71] 'Entwurf der Fortschreibung des Bildungsgesamtplans (Bildungsgesamtplan II, Stand: März 1981)', 1.10.82, Bundestag Drucksache 9/2012, p 57
[72] Michael J. Piore and Charles F. Sabel, *The Second Industrial Divide: possibilities for prosperity*, (New York, Basic Books, 1984), pp 205 – 209; Piore and Sabel also point out that many areas of the country had never specialised in mass production including leading mature industrial areas such Baden-Württemberg which became models of industrial development for the whole country

education.[73] The other was to facilitate the transformation of new scientific discoveries into industrial innovations and introduce a more praxis-oriented approach into the *Hochschulen* and other research institutions. The new policy initiatives enabled the establishment of a range of technology advisory and communication posts in the *Hochschulen* and in institutions of the Chamber of Industry and Commerce, support for cooperative research, and the introduction of a technology transfer prize as well as the creation of funding sources such as *"Auftragsforschung und –entwicklung"* (Contract Research and Development) which *Hochschulen* and *Fachhochschulen* could access to develop cooperative partnerships with industry. Schemes included, for example, the creation of the Garching Instrument Society for the industrial use of research results (a subsidiary of the MPG)[74] and the establishment of an innovation and technology centre, based around the Ruhr University in Bochum, for the exploitation of the research capacity of all of the *Hochschulen* and *Fachhochschulen* of the Ruhr area for the solving of the practical problems of the region.[75] On the one hand, the latter was a real success in bringing together engineering, natural, economic and social sciences with politics, administration, regional associations, enterprises and trade unions to solve cross-disciplinary and multi-dimensional problems. Small collaborative projects included titles such as "The mountain economy", "Innovation oriented regional policy" and "Information technology and new forms of communication". On the other hand, the centre was prevented from carrying out larger regional projects by the failure of both *Land* (Nordrhein-Westfalen) and federal authorities to fund it adequately. The plan to establish similar projects in other *Länder* was abandoned for the same reason.[76]

The microelectronics field, however, provides a wholly successful illustration of cooperation between academia and industry. Whilst the development of computer hardware originally took place mainly in industrial organisations, *Hochschulen* such as the University of Hamburg, which had developed a nationally important centre for artificial languages, played a leading and continuing role in the development of software and particularly of computer languages which required intensive basic research in the fields of logic, mathematics, linguistics and artificial intelligence.[77] Other areas in which the

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[73] Sanyal, 'Higher Education and Employment in Europe: some selected issues', p 44
[74] Probst, 'Schriftliche Frage mit den in der Woche vom 4. Februar eingegangenen Antworten der Bundesregierung', pp 28 – 29; 59 – 60
[75] von Massow, 'Organization and Promotion of Research (in particular, University Research) in the Federal Republic of Germany', p 16
[76] 'Schriftliche Frage mit den in der Woche vom 30. Januar 1984 eingegangenen Antworten der Bundesregierung', 3.2. 84, Bundestag Drucksache 10/959, p 31
[77] Mircea Malita, 'Universities as Centres of Research', *Higher Education in Europe*, Vol.5, No.2, 1.4.80, p 36

government was particularly keen to establish cooperation included health, environmental protection, resource conservation, industrial robot technology, satellite technology and communication, catalyst and membrane technology, biotechnology, fast breeder technology and atomic fusion research, all of which involved a large component of basic research coupled with "high-risk procedures" in applied research.[78] Finally, the exchange of personnel between industry and science was considered a particularly efficient form of technology transfer and was facilitated through the creation of a new financial support measure entitled *"Forschungskooperation zwischen Industrie und Wissenschaft"* (Research Cooperation Between Industry and Science). This supported the work of scientists from commercial enterprises, including small and medium enterprises, who, with the R&D priorities of their employers in mind, were sent to *Hochschulen* and other research institutions to work for a limited time. The *Fachhochschulen*, in particular, with their research emphasis on applied rather than basic science were encouraged to intensify their efforts especially with respect to small and medium-sized business in their own areas.

Higher Education and Economic Growth

The effect of these changes in higher education policy on economic growth is, inevitably, much harder to quantify. The largest proportion of the German workforce was employed in the manufacturing sector as the following table demonstrates:

Table 5.4

Employment in West Germany by economic area 1970 – 1989 in 1000s and %

Area	1970	%	1989	%
Agriculture, forestry and fishing	2,262	8.5	1,066	3.9
Manufacturing industry	12,987	48.9	10,950	39.6
Trade and transport	4,755	17.9	5,159	18.7
Service industries	2,933	11.0	4,978	18.0
State, private management etc.	3,623	13.6	5,470	19.8

Source: Statistisches Bundesamt, *Wirtschaft und Statistik*, issue 1990, p 251

[78] 'Antwort der Regierung auf die Große Anfrage der Fraktionen der CDU/CSU und der SPD', 30.11.83, Bundestag Drucksache 10/710, p 6

Despite an obvious trend from both the primary and secondary sectors to the tertiary sector over the time period, the manufacturing industry remained by far the largest employer, and was, moreover, the largest contributor to gross domestic product and gross national product. The most profitable area was the capital goods industry, in particular the machine-tool industry, the motor industry, electrotechnology products and the chemical industry. Indeed, during the 1970s and early 1980s the machine tool sector was Germany's single largest employer and exporter with an industry trade surplus more than one and half times larger than that of total trade surplus. Together, the four industries accounted for 55.4 percent of income from exports in 1975 and their growth maintained a fairly steady, if slowing, upward growth trajectory with the exception of a blip around 1975/76 and another from 1981 – 1982, both of which were a direct reaction to the effects of the oil crises on export demand.[79] The downturns, however, were considerably less severe in these industries than in gross national product as a whole and they remained the best performing groups in terms of exports.[80]

Initial perceptions, then, might indicate that economic growth depended more on the efforts of skilled, lower skilled and unskilled workers in the manufacturing industries than on graduate production from the higher education sector. However, as Abelshauser has pointed out using the examples of the chemical and car industries and mechanical engineering in particular, in comparison to the large scale standardised production of much of the rest of the industrialised world, much of West Germany's economic success was built on scientifically-based production regimes which manufactured short runs of diversified, customised high quality products.[81] West German exporters were successful in building market share on the basis of technological advance as well as a highly developed system of direct sales support.[82]

The increasingly customised nature of steel, microprocessor technology and speciality chemicals and plastics production also led to the development of highly sophisticated and more cost effective production processes and, in turn, to the need for a much more flexible workforce and the continual upgrading and intensification of training at all levels.[83] The need, therefore, was for employees combining technological excellence with a sound base

[79] Statistisches Bundesamt, *Wirtschaft und Statistik*, issues 1976, p 529; 1990, p 7
[80] Statisttisches Bundesamt, *Wirtschaft und Statistik*, issue 1975, p 762
[81] Werner Abelshauser, 'Das Produktionsregime der chemischen Industrie im sozialen Produktionssystem der deutschen Wirtschaft des 20. Jahrhunderts', in Rolf Petri, (ed), *Technologietransfer aus der deutschen Chemieindustrie (1925-1960)*, (Berlin: Duncker & Humblot, 2004) p 63
[82] Peter J Williamson, 'Winning the Export War: British, Japanese and West German Exporters' Strategy Compared', *British Journal of Management*, Vol.1, No.4, 23.8.89, p 1
[83] Piore and Sabel, *The Second Industrial Divide: possibilities for prosperity*, pp 220 – 248

of applied technical knowledge, the ability to combine technologies and to constantly innovate. This required a steady supply of high quality graduates for employment in the *Technischenberufen* [sic], (which include chemists, physicists, mathematicians, engineers and technicians). Indeed, graduates of either *Fachhochschulen* or *Hochschulen* occupied 91.2 percent of all such posts in 1987,[84] although the *Technischenberufen* accounted for only six percent of the total workforce. However, increasingly high levels of technical skill were also required both for developing and using increasingly sophisticated production processes, for example in automotive electronics, which permitted Germany's continuing dominance of the performance sections of the luxury car market. The proportion of jobs requiring high-level skills (high and medium level white-collar jobs) in other areas of the economy, including the expanding services sector, also continued to increase as a result of the effects of technological progress on the organisation of work and in management.

Thus, the effort to improve the market orientation of higher education could be argued to have had a beneficial economic effect. Certainly market forces appeared to be having an increasing effect on the study choices of new student intakes in the 1980s, while policy efforts to tie higher education more closely to the needs of industry, both in terms of encouraging regional differentiation between institutions and reorienting research efforts towards more practical innovative joint ventures and contract research, could be argued to have paid off in terms of enhanced technological achievement, enabling Germany to maintain a strong economic position within Europe and globally. In terms of employment, in 1989 one in seven graduates were self-employed. Of the rest, the majority (around 63 percent) described their positions as at the upper level with around eight percent at the very top of their professions. 11.4 percent of graduates were employed in science and technology, around 19.3 percent, predominantly male, in the areas of mining, construction, industry and the craft professions, usually at a senior level. Education and theology employed 19.9 percent and 7.4 percent were involved in business management, commerce, commercial administration, trade, banking and insurance. Of the rest who worked in the tertiary sector, 907,000 were civil servants with more than one third of them involved in teaching (at all levels).

A number of issues, however, were inconsistent with this picture of the success of the higher education policy. Amongst these was the ever-lengthening time taken to achieve a degree in the *Hochschulen*. From an average 11.4 semesters in 1982, by 1987 the average

[84] Statistisches Bundesamt, *Wirtschaft und Statistik*, issue 1989, p 72

duration of study had increased to 12 semesters. The percentage of students undertaking a fifteenth semester at university had increased from thirteen percent in 1982 to 17 percent in 1989, 57 percent of whom had still to complete their first degree.[85] A survey undertaken by the University of Konstanz in 1982/83 involving over 7,000 students at eight different *Hochschulen* indicated that one possible reason for this was the continuing problem of poor student guidance. As late as 1988 commentators were still asserting that professional career guidance "leaves much to be desired".[86] Another reason for extended study times was the tendency of many students to change disciplines mid-stream in response to fears of poor employment prospects. Employment prospects appeared worst in law and the natural sciences, but much less so in engineering, economics and medicine (where the numbers studying were considerably lower).[87]

Equally worrying were the increasing levels of skills obsolescence attested to by industrial employers between 1979 and 1992, which were attributed to the slow response of educational curriculum designers to the rapidity of technical and organisational developments in the economy.[88] A different argument suggests that insufficient funding on the part of the *Länder* to cope with mass education was the primary reason for a decline in the quality of both teaching and research and thus of lowered standards of achievement. This was largely attributable to the economic situation prevailing in the 1980s, in part at least as a result of the oil crisis of 1979, which had discouraged long-term investment in public spending and the educational services in particular.[89] Conversely, it is also possible to argue that the downturn in student numbers in higher education expected from the mid-1990s onwards did not constitute a pressing incentive to invest heavily in higher education during the 1980s.

Others argue, however, that the problems represented a failure of the attempted reforms of the higher education system. This, in turn, was largely ascribed to the persistence of the traditional structures of German universities, their didactic patterns and jealously guarded departmental and faculty autonomy. Schimank and Meier have argued that deep, bilateral mistrust existed between the professoriate and the state with ministers regarding the professors as narrow-minded defenders of their privileged position and a wholly outdated idea of *Wissenschaft*. On the other side, the professors accused the ministers of yielding

[85] Statistisches Bundesamt, *Wirtschaft und Statistik*, issue 1989, p 242
[86] Sanyal, 'Higher Education and Employment in Europe: some Selected Issues', p 48
[87] Peisert, 'Students in the Federal Republic of Germany: Diversity in Motives and Prospects', pp 24 – 25
[88] Blechinger and Pfeiffer (2000), cited in Michael Maier, Friedhelm Pfeiffer and Winfried Pohlmeier 'Overeducation and Individual Heterogeneity', in *Overeducation in Europe*, p 134
[89] Heister, 'Notes on Current Planning for Higher Education in the Federal Republic of Germany', p 256

too readily to "alleged financial pressures" and of turning higher education into an economic instrument.[90] The antagonism between the factions is illustrated by the outrage of the *Hochschulen* and associated professional bodies in reaction to the federal government commissioning the *Frankfurter Allgemeine* newspaper to write a report on the problems of the higher education system, based on evidence provided by the federal government without any consultation with either the *Hochschulen* or the Ministers of Culture of the *Länder*.[91] Additionally, higher education reform was seen as having been substantially hindered in its execution by the *Bund-Länder* relationship which was instrumental in the maintenance of the traditional university structure and encouraged the use of higher education policy reform as a political bargaining counter.[92] The counter argument to this is that the decision-making process guaranteed a voice to all agencies involved whereas a centralised authority would carry the danger of education policy being subject to constant adaptation with each change of ruling ideology and through public pressure based on fashionable whim. Moreover, one of the conditions considered by the federal government (or successfully negotiated by the representatives of the *Hochschulen*) as an essential pre-requisite to facilitate the development of competition, profiling and *Schwerpunkte* in higher education was an extension of institutional autonomy. This, however, also had the effect of further reducing the influence of the federal government on the *Hochschulen*. Because of this, planning instruments within government, and organisations such as the *Wissenschaftsrat* and the BLK were hindered from fulfilling their purpose, resulting in the failure to effectively assimilate policy decisions into the higher education sector. As one FDP politician stated: "The discrepancy between factual necessity and constitutional possibility in the reorganisation of education is simply unbearable".[93]

Conclusion

The changes which took place within the West German system of higher education from 1970 were radical. The huge and apparently uncontrolled nature of the expansion of

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[90] Uwe Schimank and Frank Meier, Förderinitiative des BMBF: Science Policy Studies, Expertise zum Thema: 'Neue Steuerungssysteme an den Hochschulen', 31.05.02, p 30, http://www.sciencepolicystudies.de/dok/expertise-schimank.pdf (accessed 4.12.2005)

[91] Debated in 'Frage für die Fragestunden der Sitzungen des Deutschen Bundestages am Mittwoch dem 12. April 1978',13. April 1978, Bundestag Drucksache 888/1689, pp 36 - 37

[92] Robert Geipel and Wolff-Dietrich Webler, 'Recent Trends in Higher Education and Research into Higher Education in the Federal Republic of Germany', *Higher Education in Europe*, Vol.12, No.1, 1.1.87, pp 76 – 80

[93] Helga Schuhardt, quoted in Erk, 'Federal Germany and Its Non-Federal Society', p 309

student numbers had a number of consequences. It soon became evident that untrammelled expansion was not only financially unfeasible, but also undesirable in the sense of producing large numbers of graduates for whom there was a lack of suitable employment, which in itself represented a waste of resources. As the public purse strings tightened in response to both internal and external economic pressure in the form of the oil crises and subsequent inflation and recession, successive federal government coalitions, both SPD-led until 1982 and CDU/CSU-led thereafter, argued increasingly strongly for a change to the traditional academic format and a much closer orientation to the needs of the economy in terms of improved student career guidance, improved curriculum planning, constant course revision to reflect the most modern scientific discoveries and increased vocational and professional training in the areas most necessary for economic growth. At the same time, there was no leeway for government to actively restrict entry to higher education, something which would have been both politically unpopular and unconstitutional. Initiatives in the form of the development of new institutional formats, competition between *Hochschulen* and differentiation of institutional education and research profiles were introduced to try to increase efficiency, connect *Hochschulen* with their immediate geographical environment, encourage interdisciplinary and inter-*Hochschulen* cooperation in research and develop cooperative projects with extra-academic research institutions and industry.

While there was a rise in graduate unemployment over the two decades, it was relatively small in comparison to the very much higher number of low- and unskilled workers who were affected by unemployment. It appeared that graduates were readily employable, even if not always in traditional graduate sectors such as the civil service, nor always in positions suited to their qualification level. The effect of the changes on economic growth is considerably harder to quantify. Despite a perceptible change to the tertiary sector, unlike many other industrialised countries the manufacturing industries remained the country's economic driver, in particular the capital goods industries. These required large numbers of skilled, lower-skilled and unskilled workers, but also depended heavily on constant innovation and increasingly sophisticated technology in both product development and production processes. Consequently, a steady supply of well-trained employees at graduate level or above was required to maintain their global dominance of niche markets. The students' choice of subject was, therefore, particularly significant and the evidence suggests that the economic situation, coupled with lowered employment prospects encouraged a slow change from the humanities to the engineering sciences and other practical disciplines which were of more direct benefit to the economy From that

point of view, the structural changes enacted in the higher education system over the twenty years under consideration appeared to have been at least somewhat effective.

On the negative side, the sheer cost of expanding higher education in line with social demand had a massive impact on both federal and *Länder* budgets. Overcrowding and the necessity to trim costs as much as possible led to what is generally agreed to be a lowering of academic and teaching standards and of the standard of research produced in the *Hochschulen*. Industry continued to complain about the level of technical obsolescence of graduate knowledge caused by the inability of the *Hochschulen* to keep pace with the rapidity of developments in the relevant disciplines. It could be argued, moreover, that the technological advances which powered the growth of West Germany's main growth industries, and thus the economy as a whole, were far more the result of applied research carried out within industry itself or in institutions such as the Fraunhofer Societies, rather than stemming from the basic research carried out in the *Hochschulen*. Exacerbating this, there was a history of extreme reluctance to share research results thus inhibiting the process of technology transfer, and to participate in interdisciplinary projects or those with agencies outwith academia. There were, nevertheless, some outstanding successes with regard to this as the example of Hamburg University's contribution to the microelectronics project proved. Moreover, despite the fact that West Germany's strength appeared to lie in incremental innovation to existing technology stemming from applied research, not in the basic research carried out in the *Hochschulen*, it was the *Hochschulen* which were responsible for the scientific training of those who performed the applied research. Finally, the extreme bureaucratic hurdles created by the highly centralised political system and the entrenched inflexibilities of the higher education system itself, not least the reluctance of academia to adopt a more vocational orientation and subscribe to a modern vision of '*Wissenschaft*', proved to be fairly high barriers to overcome in the pursuit of economic progress.

The parallels between the policy aims and initiatives of the West German government and some of the aims and principles of the Third Higher Education Reform bill in East Germany are plain. The following chapter will explore the effects of the implementation of this bill on the higher education system and the economy of the GDR.

Chapter 6

Change and Reform in East German Higher Education 1971 – 1990

The end of Ulbricht's reign as Party leader saw the emergence of a new ethos in the GDR with a very different emphasis and an ostensibly more ideologically focused approach. New leader Erich Honecker claimed that "only by paying attention to socialist principles can socialist outcomes be achieved"[1] and very quickly began implementing policy decisions which differed radically from those of Ulbricht. All areas of GDR life, including the higher education system, became subject to increased levels of centralisation under the control of the SED because only the "tightly organised center …has the necessary insight into the laws of social development to scientifically plan and direct this mission".[2] Funding for research into high technology and the pursuit of the scientific and technological revolution were immediately downgraded in favour of developing Honecker's 'unity of social and economic policy',[3] which was intended to narrow the gap in living standards compared to West Germany and thus increase acceptance of the new regime, and the development of a consumer society of a standard equal to, or better than, that of West Germany. [4]

Consequently, the education system, and higher education in particular, were restructured in order to conform to what were seen as the new social and economic priorities. The expansion of the higher education sector was summarily stopped and post-compulsory education was directed towards the training of lower-skilled workers to man the production lines in the factories. The result was a considerable level of underemployment in the workforce and social discontent. By the late 1970s, moreover, it became evident that the new programme was not having the desired effect and high-tech research, particularly into microelectronics, again became seen as the only viable route to increased productivity and economic growth in the increasingly impoverished country. The abrupt switch of emphasis left the lower-tech, more traditional industries to decline. Strenuous

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[1] Erich Honecker, 'Address to the XIII. Parteitag der SED', *Neues Deutschland*, 16.6.71, p 9
[2] Günter Mittag, in Horst Betz, 'East Germany: The Primacy of Dogma over Reform", *Journal of Economic Issues*, vol. VIII, no.1, 1974, p 85 (Translation by Betz)
[3] The aim of this was to protect the 'workers' from fluctuations in the market with guaranteed shelter, clothing and food by heavily subsidising the cost of a wide range of basic goods and rent. It should also be noted that the final debts sustained at the end of Ulbricht's tenure as leader were incurred by Erich Honecker in his role Central Committee Secretary for security matters
[4] Erich Honecker, *Direktive des IX. Parteitages des Sozialistischen Einheitspartei Deutschlands zum Fünfjahrplan für die Entwicklung der Volkswirtschaft der DDR 1976 – 1980*, (Dresden, Verlag Zeit im Bild, 1976), pp 9 – 14

attempts were made to expand higher education once again and it became the focus of efforts to turn around the nation's decline through the development of industrial innovation. Honecker's policies were characterised by two watchwords in particular – *Intensivierung* and *Rationalisierung* (intensification and rationalisation). This chapter will examine the effects of the change of leadership and ideological emphasis on the system of higher education, exploring the successive changes implemented and the consequences for higher education and scholarship in the GDR. I will also analyse the impact of the changes of direction in R&D on higher education and attempt to assess the implications of this for the GDR's economic position during the final twenty years of its existence.

Restructuring Higher Education

A Change in Emphasis

As suggested in chapter four, there was little doubt that by the beginning of the 1970s there was a considerable surfeit of graduate engineers in the GDR. Education Minister Margot Honecker stated that, during the Ulbricht era, the false impression had been created that the function of high school, and the EOS (*Erweiterte Oberschule)*[5] in particular, was to prepare young people for higher education. This had led to entry figures for the *Hochschulen* which were unjustifiable on social and economic grounds and which had also signalled a marked decline in the representation of young people from working class homes.[6] At the 8th Congress of the SED in 1971, Erich Honecker reported that over 250,000 graduates had taken up employment during the previous Five-Year-Plan period while the numbers studying had increased from 225,700 to 302,400.[7] The planners therefore believed that any further increase would exceed the available employment opportunities and the current needs of the economy. The expansion of the higher education sector had, moreover, led inevitably to a serious shortage of apprentices in many sectors of industry and of skilled and lower skilled workers on the production lines. This was a situation which had also arisen in West Germany; however, there it posed a considerably smaller problem firstly because of its fast-growing population and secondly because of the large numbers of *Gastarbeiter* who had been encouraged into the country to perform many of the lower skilled jobs in the economy.[8] The population of the GDR,

[5] This comprised an extra two years of high school for the more academically gifted
[6] Margot Honecker, cited in John Page, 'Education under the Honeckers' in David Childs (ed.), *Honecker's Germany*, (London, Allen and Unwin, 1985), p 57
[7] Erich Honecker, *Neues Deutschland*, 16.6.71, p 7
[8] See chapter 3 of this thesis for a longer discussion of this

however, was at best static and suffered a downward trend for most of the country's existence. Moreover, while there had been plans to 'invite' a large number of foreign workers from other eastern bloc countries and eventually also Africa and Asia to work in the GDR, these had been put on hold immediately following the building of the Berlin Wall which was expected to end the requirement for them. Towards the end of the 1960s there was an increase in the number of foreign "contract workers" in the country, but their numbers remained comparatively limited.[9]

A number of changes took place very rapidly. One was to reduce the dependence of academia on industry for its research funding which had been a source of some criticism and dissent in the previous administration. This allowed a greater concentration on basic research in the *Hochschulen* than had previously been possible, although the *Akademie der Wissenschaften* still performed the majority of basic research. The funding of basic research became the task of the state, while the *Akademie* and the Ministry of Higher Education were handed the responsibility for its planning and execution.[10] The second was the attempt of the economic and educational planners to achieve a correlation between educational qualification and the demands of the workplace by forcing youngsters into the factories where the shortages of labour existed. The education system was reconstructed accordingly. The expansion of higher education and of the EOS was summarily stopped with the numbers permitted to prepare for the *Abitur* showing a continuous fall thereafter from 27,928 in 1973 to 22,156 in 1980. Additionally, the numbers permitted to prepare for the *Abitur* while undergoing vocational education also decreased rapidly, falling from 43,975 in 1970 to 31,949 in 1980. Further training opportunities for adults and qualification for higher education by means of evening classes and distance learning were likewise severely restricted.[11] Finally, the proportion of working class students in the *Hochschulen* was reengineered upward from 38 percent to form a more ideologically acceptable 55 – 60 percent.[12]

It was anticipated that by cutting higher education provision, more funding would be available for the extension of lower-level vocational education in the *Fachschulen* (technical colleges), including the development of 28 new courses in subjects such as

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[9] André Steiner, *Von Plan zu Plan*, (München, Deutsche Verlags-Anstalt, 2004), p 127
[10] Raymond Bentley, *Technological change in the German Democratic Republic*, (Boulder, Col., Westview Press, 1984), chapter 7
[11] *Statistisches Jahrbuch der Deutschen Demokratischen Republik*, (Berlin, Staatsverlag der DDR, 1981), p 288
[12] Erich Honecker, *Bericht des Zentralkomitees an den IX. Kongreß der Socialistschen Einheitspartei Deutschlands*, (Dresden, Verlag Zeit im Bild, 1976), p 46

electronics, BMSR technology[13] and data processing which would help address the deficits experienced in industry. By 1980 all households were to possess a refrigerator, 80% a washing machine, and 97% a television set. The production of the ministry for general machinery, agricultural machines and vehicles was to increase by at least 125%; that of the ministry for electrotechnology and electronics by at least 144%; that of the ministry for light industry by at least 123%; and that of the ministry for the chemical industry by at least 130%. In order to increase production capacity in industry to achieve these goals, the planners estimated that, a further 130,000 extra workers were required for consumer goods production and other key sectors of the economy with the ultimate aim being to train around one million school leavers as skilled workers by 1980.[14] As a result there was decline in the number of those studying at *Hochschule* level from 1972 until 1979, both in terms of absolute numbers and as a proportion of the population. However, while there was an initial rise in numbers attending the *Fachschulen,* this began tailing off almost immediately. The following table shows the changing pattern of study in the *Fach*- and *Hochschulen* over the decade:

Table 6.1

Student numbers in East German Fach- and Hochschulen 1970 - 1980

	Fachschulen		Hochschulen	
Year	Total	% female	Total	% female
1970	167,158	48.6	143,163	35.4
1971	178,883	50.1	158,014	37.1
1972	176,867	50.8	160,967	40.7
1973	162,25	53.4	153,558	44.5
1974	154,528	59.2	144,606	47.0
1975	156,384	65.3	136,854	48.2
1976	159,955	69.0	130,201	47.7
1977	162,460	69.9	129,615	47.5
1978	164,632	70.5	127,473	47.6
1979	169,608	71.3	129,055	48.2
1980	171,825	71.9	129,970	48.7

Source: Statistisches Jahrbuch der Deutschen Demokratischen Republik, 1989, p 58

[13] Betriebs-, Mess-, Steuerungs- und Regelungstechnik (technical equipment, installation, measurement, control engineering)

[14] *Direktive des IX. Parteitages der SED,* (Berlin, Dietz Verlag, 1976), pp 7, 47, 59, 140, 146; by the end of the regime's existence the proportion of GDR households with a television set had risen from 17 percent to 69 percent; with a refrigerator from 6 to 56 percent; and with a washing machine from 6 to 54 percent, from Mike Dennis, *German Democratic Republic: Politics, Economics and Society,* (London, Pinter Publishers, 1988), p 33

Immediately obvious is the decline in the number of those studying at *Hochschule* level from 1972 until 1979. The figures for those studying in the *Fachschulen* also seem to indicate a reduction from their zenith in 1971 until 1974, from when there was slow growth until 1980. The initial reduction in numbers is even more noteworthy because within the time period 1971 – 1980 there was an increase of eighteen percent in the numbers of the relevant age cohorts.[15] One reason suggested for the decline in student numbers in the *Fachschulen* was the progressive downgrading of theoretical content of most *Fachschule* courses in favour of a more practice-based approach. Practical training was shifted to, and heavily oriented towards, the work benches of local production collectives and so closely oriented to a particular collective that the fifth semester was devoted exclusively to the tasks which would be met within that firm. The whole of the sixth and final semester was then spent in the firm. The lowered theoretical content and new structure of the courses, however, diminished the possibility of using graduation from a *Fachschule* as a route to higher education, which, in turn, dissuaded some from the idea of applying to study there.[16]

At the same time, there was a significant rise in the proportion of female students in both *Hochschulen* and *Fachschulen*. In the *Hochschulen*, this reflected the much greater intake of women into previously male employment bastions such as engineering and science and the quota system which had been introduced in 1965 to ensure this. By 1981, for example, almost one third (31.1 percent) of GDR engineers were female compared to only 7.5 percent in 1964. Of these, Augustine states that the majority were employed in chemical engineering, pharmaceutical and textile engineering, constituting over forty percent of chemists in industry. From 1975 onwards they represented over half the engineers employed in computer science, particularly in information processing.[17] In the *Fachschulen*, the rise in numbers of female students (from 48.6 percent of the student population in 1970 to 71.9 percent in 1980) was probably reflective of the increasing number of courses in more traditionally female occupations being offered there such as nursing and clerical work, although many women wishing to study engineering were also attracted to the *Fachschulen* because of the shorter duration of the courses there which were more easily assimilated with familial obligations than those in the *Hochschulen*.[18]

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[15] *Statistisches Jahrbüch der Deutschen Demokratischen Republik*, 1981, p 64
[16] Dietmar Waterkampf, 'Das Einheitlich Bildungssytem der DDR in den Siebziger Jahren', in Oskar Anweiler and Frierich Kuebart (eds), *Bildungssyteme in Osteuropa Reform oder Krise?*, (Berlin,Verlag Arno Spitz, 1983), pp 49 – 52, 54
[17] Dolores L. Augustine, *Red Prometheus: Engineering and Dictatorship in East Germany 1945 - 1990*, (Massachusetts, Massachusetts Institute of Technology, 2007), pp 261 and 267
[18] Augustine, *Red Prometheus*, p 98

The planners, however, failed to attract the planned number of applicants in a number of subjects. In particular, there was a substantial fall in admissions to study the technical sciences, agriculture and economics between 1970 and 1980. In 1978, for example, there were complaints that the admissions quota for design engineer training at the *Technische Hochschule* Karl-Marx-Stadt had not been fulfilled for several years.[19] The following table demonstrates the extent of the fall:

Table 6.2

Admissions to study technical sciences, agriculture and economics in East German Fach- and Hochschulen 1970 – 1980 and % change

	Technical sciences		Agriculture		Economics	
Year	**F/schulen**	**H/schulen**	**F/schulen**	**H/schulen**	**F/schulen**	**H/schulen**
1970	21,370	15,443	4,256	1,530	17,652	6,772
1975	13,458	10,512	3,695	1,821	10,792	4,977
1980	13,147	9,413	3,436	1,815	10,206	4,692
% change 1970 – 1980	- 38	- 39	- 19	+ 19	- 42	- 31

Source: *Statistische Jahrbücher der Deutschen Demokratischen Republik* 1971, 1976, 1981

One possible reason for the decrease in the numbers studying these disciplines in the *Fachschulen* was the subject choices of the increased intake of female students as described above. Another potential reason is because these subjects had previously been the main conduits for moving from *Fachschule* into higher education. The inability to do so for a time after 1971, therefore, may have had an impact on the numbers choosing to study these subjects.[20] The reason for the downturn in *Hochschule* numbers in the technical sciences and economics is a little less clear, although may be reflective of planning decisions based on a perceived over-supply of graduates in the technical sciences and economics. The nineteen percent rise in figures for the study of agriculture in the *Hochschulen* is very low in absolute numbers and thus probably not very significant.

Effects on the Labour Market

The restructuring attempt did not appear to be particularly effective however. From the middle of the 1970s it became obvious that a substantial disproportion still existed

[19] 'Auswertung der Konstrukteurkonferenz am 19. und 20.5.78 an der TH Karl-Marx-Stadt', SAPMO DY 53/687
[20] Waterkampf, 'Das Einheitlich Bildungssytem der DDR in den siebziger Jahren', p 54

between qualification levels and workplace demand. At least 25 percent of those with skilled worker qualifications were employed in occupations below their level of ability and studies in 1978 and 1980 confirmed that around 40 percent of all industrial jobs were being carried out by *Fachschule* graduates although only ten percent required that level of expertise.[21] The situation appeared even worse for graduates of higher education. A 1973 survey demonstrated that 56 percent of these were working in positions below their qualification level. Because of the GDR's system of central planning, this trend cannot be attributed to labour market adjustment and the desire of employers to employ more highly qualified workers in order to improve productivity levels. Indeed, the same survey indicated that 41 percent of positions which technically did require workers with a degree-level qualification were held by those with a lower qualification and follow-up surveys in 1980 indicated little change.[22] Some of the reasons for graduate underemployment were discussed in chapter four. Others include an oversupply of engineers in the labour force and the switch from the pursuit of the scientific-technological revolution which had left some graduates in a number of engineering specialties surplus to requirements. However, another factor concerned the almost blanket job security offered in GDR firms, so that despite a clear need for those with degree-level qualifications in new spheres of technology at senior levels in the workplace, those already in position remained where they were regardless of ability.

A further issue with respect to this concerns the continuing resistance to the employment of highly qualified women in supervisory roles over men in industry. While there was a much greater degree of gender equality in the East German engineering profession than in the West, at least in terms of numbers, despite increased day care provision and the introduction of incentives to study, work and produce offspring, gendered job selection prevailed strongly. Women were very often under-employed in administrative jobs or performed other office-based jobs such as engineering economics or technical design rather than working with heavy machinery.[23] It should be pointed out, however, that gender bias was not limited to industry. Within academia the position of women was very little better. While much rhetoric was expounded about the need to "use more effectively the large intellectual potential of female cadres" in order "to continue the creation of the

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[21] Anna-Jutta Pietsch, 'Reaktionen im Ausbildungs- und Beschäftigungssytem auf Probleme der Bildungsexpansion in der DDR under UdSSR', in Anweiler and Kuebart (eds), *Bildungssyteme in Osteuropa Reform oder Krise?*, pp 216 – 218

[22] Raymond Bentley, *Research and Technology in the former German Democratic Republic*, (Boulder Col., Westview Press, 1992), pp 93 – 94

[23] 'Probleme der Qualifizierung und Förderung von Frauen' pp 13 – 14, SAPMO DY 30 IV A 2/9.04/618; Augustine, *Red Prometheus*, pp 261, 286

developed socialist state", the proportion of higher education teachers who were female increased from 3.4 percent in 1971 to only 8.2 percent in 1985, the vast majority being employed at docent level. In the whole country there were only 127 female full professors and 374 docents. Most of the female cadres in higher education were employed as scientific assistants on short-term contracts.[24]

Social Consequences

The consequences of chronic graduate underemployment were mounting levels of job dissatisfaction, high job turnover rates and poor motivation in the workplace.[25] These were heightened by the ideological shift from support for the intelligentsia and back towards the promotion of the working class under Honecker, one manifestation of which was a marked narrowing of the pay differentials between scientists and technologists and unskilled production line workers. The negative impact on professional identity and pride this created was exacerbated by the knowledge of the greater status of, and very much greater salaries earned by graduates in West Germany.[26] It would be wrong to underplay the effects of this policy on worker productivity and commitment to the cause of socialism. It caused a serious undercurrent of discontent and dissent in the population partly stemming from the obviously inefficient utilisation of their creative potential, and partly from intellectual frustration at the prospect of spending their lives working at below their level of intellectual capability with no prospect of upward mobility.[27]

Moreover, the policies of the GDR educational planners ran counter to USSR guidelines to the socialist states issued in 1974. These stated that substantial sums of money should be set aside for educational expansion because the rapidly progressing scientific-technological revolution demanded a constant and swift increase of the general level of qualification in the population. Moreover, because science had become officially recognised as a direct force of production, the expansion of the higher education system and of the scientific institutions was regarded as particularly important.[28] The GDR authorities were not unaware of the huge gulf between this and the reality in their own state. The western idea

[24] 'Information über das Rundtischgespräch zu Ergebnissen, Erfahrungen und weiteren Aufgaben bei der Entwicklung von Frauen zu Hochschullehrern', 2.4.1986, SAPMO DY 53/1090
[25] Pietsch, 'Reaktionen im Ausbildungs- und Beschäftigungssytem auf Probleme der Bildungsexpansion in der DDR under UdSSR', pp 216 – 218
[26] Bentley, *Research and Technology in the Former German Democratic Republic*, pp 93 – 94; see also Steiner, *Von Plan zu Plan*, p 180; Augustine, *Red Prometheus*, pp 298, 322
[27] Waterkampf, 'Das einheitliche Bildungssytem der DDR in den siebziger Jahren', p 54
[28] D. Glowka, cited in Oskar Anweiler, 'Bildungssyteme in Osteuropa – Reform oder Krise?', in Anweiler and Kuebart (eds), *Bildungssyteme in Osteuropa Reform oder Krise?*, p 13

of 'de-coupling' the qualifications of graduates from their future employment status, which was being extensively discussed in some other socialist countries, was politically unacceptable to a GDR leadership wedded to the idea of manpower forecasting and central planning in all spheres. Günter Mittag, for example, argued that:

> Greatest economic efficiency in socialist mass production can only be achieved if a harmony of the interests of society with those of the collectives and individuals is continuously re-established on the basis of the central plan[29]

Despite their lack of success in correlating educational provision to the demands of industry, however, the planners realised that they could not effect further reductions in further and higher education numbers without completely belying the essential concept of socialist educational policy and further disaffecting the population as a whole. As it was, the restrictive policies already introduced appeared to be leading away from a unified to a two-tier education system. The constraints on, and more selective streaming for, entry to higher education meant that virtually the only route into a *Hochschule* was via the EOS.[30] This, in turn, limited the possibility of social mobility for many, reinforced social stratification and was a further cause of demotivation among the young.

Economic Consequences

The change in emphasis from higher to lower-level vocational education, moreover, failed to have the desired effect on the economic fortunes of the GDR, although this must be seen in the light of the very short time period in which it was expected to take effect. There was certainly a large increase in retail turnover from 64.1 to 82 billion marks from 1971 – 1976 and in the provision of all types of consumer goods; however, a substantial proportion of these had had to be imported from the West. By 1974 there had been a rise of 79 percent in the imports of consumer goods and those of machinery and intermediate products had also increased resulting in a considerably widened balance-of-payments deficit.[31] By the end of the 1970s the GDR was running dangerously high trade deficits with both the West and with the Soviet Union[32] as the following table demonstrates:

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[29] Günter Mittag, quoted in Betz, 'East Germany: The Primacy of Dogma over Reform', p 90 (Translation by Betz)
[30] Waterkampf, 'Das Einheitlich Bildungssytem der DDR in den Siebziger Jahren', p 54
[31] *United Nations Economic Bulletin for Europe*, 1981, Vol. 27, 1976 – 1978, p 43
[32] 'East Germany, Foreign Trade', http://www.country-data.com/cgi-bin/query/r-5103.html p 6 (accessed 20.2.2008)

Table 6.3

GDR foreign trade by groups of countries* 1971 - 1980

As percentage of total	**1971 – 75**	**1976 – 80**
Total Imports		
Centrally Planned Economies[1]	65.0	65.8
Eastern Europe	62.1	62.8
USSR	33.9	35.0
Developed Market Economies[2]	30.9	29.1
Developing Market Economies	4.1	5.1
Total Exports		
Centrally Planned Economies	72.7	72.4
Eastern Europe	68.9	68.9
USSR	36.6	35.4
Developed Market Economies	23.2	21.9
Developing Market Economies	4.1	5.7
In Valuta Marks Billion[3]		
Trade Balance	**-7.00**	**-28.00**
Centrally Planned Economies	+6.06	-3.34
Eastern Europe	+4.94	-3.83
USSR	+1.22	-9.06
Developed Market Economies	**-12.84**	**-25.27**
Developing Market Economies	-0.21	-0.21

*Based on statistics of GDR trading partners as GDR statistics give figures for foreign trade turnover only
[1]Soviet bloc countries plus China, Yugoslavia, North Korea and Laos
[2]OECD countries
[3]Unit of account for GDR foreign trade purposes. For 1982: VM 1 = DM 0.713
Source: Frowen, 'Economy of the GDR' in David Childs, *Honecker's Germany*, (London, Allen and Unwin, 1985), p 42

By 1979 total hard currency debt had reached 39 billion marks despite Soviet warnings that the maximum the GDR economy could sustain was 6 billion. The situation was further exacerbated by the 1973 oil crisis and general global economic downturn. While East Germany was largely protected from the rising oil prices caused by the 1973 crisis because of a five-year agreement on supplies with the Soviet Union, it had much greater difficulty in finding markets in the recession-hit West.[33] Stokes has argued moreover that the GDR, to a far greater extent than any other industrialised nation, was dependent on world trade because in the virtual absence of any domestic raw material provision, the import of raw

[33] Jeffrey Kopstein, *The Politics of Economic Decline in East Germany, 1945 – 1989*, (Chapel Hill, The University of North Carolina Press, 1997), pp 12, 88

materials had to be financed by the export of finished goods.[34] Eventually, however, even as pressure from the population to import even more Western goods and technology and food was increasing, the Trade Minister was forced to concede that increasing exports would no longer be able to cover the deficit.[35]

Policy Reversal

As a consequence, towards the end of the 1970s scientific research, particularly into high technology, again began to be seen as the answer to the nation's economic woes. In what Maier has referred to as the somewhat belated recognition of the fundamental need for an increase in the level of research and development in order to keep pace with changes in the computer and microelectronics industry,[36] but also in an attempt to close the technological gap with the West which was a cause of the increasing uncompetitiveness of East German exports, the directives of the 9th Party Congress in1976 stated that recruitment to both *Fachschulen* and *Hochschulen* were again to be expanded. Honecker also highlighted the need to raise the qualifications level of those cadres employed in research particularly in the fields of mathematics, mechanics, cybernetics, data processing, elementary particles, molecular and nuclear physics, plasma and solid-state physics, optics and quantum electronics, isotopes and radiation techniques, bio-sciences and biotechnology stating that:

> Enrolment in higher and skilled education and its differentiation along subject lines is to be so achieved as to correspond to the long-term requirements of societal and scientific-technological progress, and in accordance with the planned development of the qualifications structure of the available work in society[37]

Additionally, a new research facility was to be constructed within the *Akademie der Wissenschaften* for the study of the scientific principles of semiconductors and semiconductor technology[38] and science and technology were to be allocated a funding increase of 10 billion marks in order to enable the long term development of basic research

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[34] Raymond G. Stokes, *Constructing Socialism: Technology and Change in East Germany 1945 – 1990*, (Baltimore, John Hopkins University Press, 2000), p 155
[35] Kopstein, *The Politics of Economic Decline in East Germany*, pp 96 – 100
[36] Charles S. Maier, *Dissolution: The Crisis of Communism and the End of East Germany*, (Princeton, Princeton University Press, 1997), p 74
[37] *Direktive des IX. Parteitages der SED*, p 146
[38] Erich Honecker, *Protokoll des IX. Parteitages der SED*, Vol. 2, pp 241, 417

in natural science and mathematics and to put the results into production.[39] The Fifth Educational Congress of 1980 subsequently resolved that microelectronics should be introduced as a stand-alone discipline for engineers.[40]

The policy was lent support by a report of a panel of senior economic advisors of the governments of the Economic Commission for Europe (ECE) among whom was Köhler, the GDR Minister for Economic Affairs. Its conclusion was that there was a necessity for centrally planned economies to move from extensive to intensive growth by increasing overall efficiency. However, it strongly stressed that as one of the main driving forces of economic growth was the development of science and technology, it was essential to develop a more effective scientific and technological community in order to supply both the intellectual foundation for the generation of knowledge and the capacity to apply it in the solving of development problems. Further research by the ECE in 1980 concluded that, particularly in a situation where the demographic trend was static or downward, as was the case with the GDR virtually throughout its existence, growth in labour productivity accompanied by constant product innovation was the only conceivable means of increasing long-term industrial growth.[41]

There were, moreover, other pressing incentives to expand higher education. One simple one, for instance, was the need to train substantial numbers of new schoolteachers to replace the large numbers about to retire.[42] Another was indicated in the directives of the Ministry for Higher and Technical Education which followed the Fifth Higher Education Conference, where it was stated that the support and development of young academics was to become a special focus for the managers in higher education because of the pressing need for an increase in the numbers of highly qualified docents.[43] It should be noted that there was some ambiguity in the reporting of some of the figures in the Statistical Yearbooks. The general trend, however, as demonstrated by *Figure 6.1*, indicates a sharp increase in the number of new admissions around the early 1980s with a further surge in 1986. Nonetheless, the overall trend from 1969 continued downward, if less relentlessly than through the 1970s.

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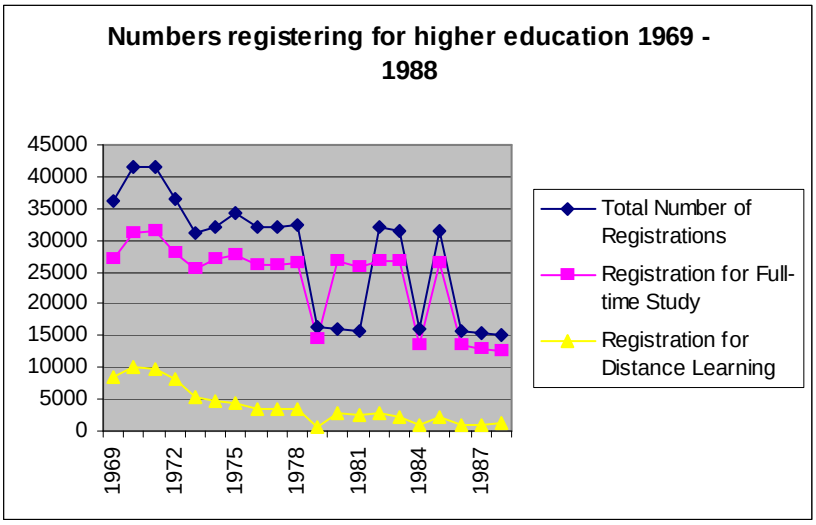
[39] Erich Honecker, *Neues Deutschland*, 19.5.76, p 6
[40] Erich Honecker, *Neues Deutschland*, 20.3.1980, pp 3 – 4
[41] *United Nations Economic Bulletin for Europe*, 1981, Vol. 33, No.3, pp 383, 388 – 389
[42] Letter from Margo Honecker to the Genossen des Bezirksschulrates und des Kreisschulrates, 15.10.84, SAPMO DY 53/1098,
[43] Ministerium für Hoch- und Fachschulwesen, 'Direktive für das Studienjahr 1983/84 and den Universitäten und Hochschulen der Deutschen Demokratischen Republik', 1983, SAPMO, DY 53/1086, p 21

Figure 6.1



Source*: Statistisches Jahrbuch der Deutschen Demokratischen Republik,* Vols. 1970 - 1989

However, despite an increase in the numbers *enrolling* for higher education, because there was a simultaneous downward trend in the population level over the 1970s and 1980s, the overall number of those studying in both *Hochschulen* and *Fachschulen* actually fell, as demonstrated by the following table:

Table 6.4

Student numbers in GDR Fach- and Hochschulen 1981 - 1988

	Fachschulen		Hochschulen	
Year	Total	% female	Total	% female
1981	173,411	72.7	130,633	48.8
1982	172,058	73.4	130,442	49.3
1983	167,864	73.4	130,097	50.0
1984	163,573	73.4	129,628	49.9
1985	162,221	72.6	129,885	50.1
1986	160,379	71.7	131,560	50.3
1987	158,777	70.6	132,602	50.2
1988	157,513	70.3	132,423	49.2

Source: *Statistisches Jahrbuch der Deutschen Demokratischen Republik*, 1989, p 58

Prioritising Ideology

At the same time, within the *Hochschulen* the influence of the SED was becoming increasingly dominant. Among the student body this was noticeable in the increasing

powers of the FDJ to enforce compulsory attendance, not only at lectures, but at political meetings, elections and 'voluntary' student activities. The amount of instruction in Marxism-Leninism (for which the SED was responsible) was intensified, as was instruction in matters such as the creation of the socialist character of work, the unity of technical-economic and social-economic task setting and world-view political education and training.[44] Moreover, while membership of the party and absolute and overt political loyalty became virtually mandatory for a senior position in any field, this was particularly so in higher education where the university and *Hochschule* leadership were entrusted with the education of youth and the transmission of the socialist ethos. Hence, those at the helm of the *Hochschulen* were invariably members of the SED. The rector of the TH Karl-Marx-Stadt, for example, stated that as part of their responsibility for the development of the society as a whole, the teaching staff saw its duty as being:

> to educate our students in the ways of communist behaviour…Much depends on the way in which we comrade professors are a model for communism...the goal is to shape graduates who are in a position to create our communist future [45]

While it is likely that the best teachers and researchers in the universities and *Hochschulen* still regarded themselves primarily as engineers and scientists and tried to conduct themselves accordingly, there were a substantial number of others arguably chosen less for their expertise in the field than for their unswerving loyalty to party principles. Indeed quotas were set for the proportion of the academic staff which was required to belong to the SED. Although Party loyalty obviously did not imply a lack of academic competence in individual professors, the general consensus appears to be that the majority of the higher education teaching body was hired on its political credentials and that higher education teaching was academically much poorer than in West Germany.[46]

New Initiatives

A number of new measures were introduced. In an attempt to increase the number of students in metallurgy, metal processing, electronics and electrotechnology in particular, a considerable amount of stress was laid on the need to acquire more students from industry. In order to prepare these applicants for higher education a new one-year intensive

[44] See for example 'Auswertung der Konstrukteurkonferenz am 19. und 20.5.1978 an der TH Karl-Marx-Stadt', in SAPMO DY 53/687
[45] Horst Weber, in *Protokoll des IX. Parteitages der Sozialistische Einheitspartei Deutschlands*, Vol. 2, pp 109 – 110
[46] Bentley, *Research and Technology in the former German Democratic Republic*, pp 94 - 95

preparatory course was developed.[47] Secondly, in order to try to conform more closely to the needs of industry, specialisms within disciplines in the *Hochschulen* were to become even more narrowly focused than previously. In order to assist this process, curricula were revised with some of the lectures in compulsory subjects dropped in order to increase the number of those in the students' chosen specialty. Additionally, individual study plans were to be developed in line with individual research interests and more personal research time built in. Postgraduate provision was to be considerably extended and the students offered more seminar time for "free and open scientific discussion" and encouraged to take part in high-level scientific seminars, as well as collaborative projects with the Academy of the Sciences and other scientific institutions, both in the GDR and in other socialist countries.[48] Thirdly, more funding was allocated to the development of cooperative relations between the *Hochschulen* and agriculture and industry;[49] however, the funding of research in the *Hochschulen* once again became the main responsibility of industry. In some institutions, such as the Friedrich-Schiller University in Jena, industry was funding more than 90 percent of research in physics by 1986.[50] This development, however, inevitably led to a resumption of friction between academia and industry as to what should be seen as the main priority areas for research in the *Hochschulen*.

A fourth initiative concerned the development of a new programme for the education and continuing education of engineers and economists which introduced the differentiated training of both professions with a much higher level of theoretical education. Engineers would concentrate either on the development of new products and their production or on the effective organisation and management of the collectives in order to turn research findings into technical and technological solutions. Economists would focus either on the solution of problems of the economy as a whole or on the problems of individual firms, again in a management capacity.[51] Fifthly, the decision was taken in 1981 to upgrade the engineering *Fachschulen* to *Fachhochschulen* with a consequent upgrading to university level of the teaching and qualification level offered there and of the research undertaken.[52] This was followed by a decision in 1986 to integrate some of the original engineering *Fachschulen* with existing *Hochschulen* to form institutions "characterised by the unity of

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[47] Letter from Herr Rinke (Gewerkschaft Wissenschaft) to Prof. Dr. Böhme, (Minister für Hoch- und Fachschulwesen), 19.5.1983, SAPMO DY 53/1086,
[48] Erich Honecker, *Neues Deutschland*, 20.3.1980, pp 3 – 4
[49] Direktive des X. Parteitages, *Neues Deutschland*, 12.4.1981, p 9
[50] Bentley, *Research and Technology in the former German Democratic Republic*, pp 83 – 84
[51] *Das Hochschulwesen*, Heft 9, September 1983, pp 3 – 5, SAPMO, DY 53/1086
[52] 'Anweisung über die Anwendung arbeitsrechtlicher und tarifrechtlicher Bestimmungen im Prozeß der Profilierung und Konzentration von Kapazitäten zur Umsetzung der Konzeption für die Ausbildung von Ingenieuren und Ökonomen, von Technikern und Wissenschaftlern', 4.6.81, SAPMO DY 53/1089

practical employment skills and theory". Additionally, the building of a new *Technische Hochschule* in Berlin for 4,000 – 5,000 students, which was to become a centre of excellence for engineering science, was commissioned.[53] Finally, the planners' aim was that by 1990 around 67 percent of the workforce should consist of graduates from either higher education or technical college; thus, between 1986 and 1990, admissions to higher education and technical colleges were to comprise 22 – 23 percent of the relevant age cohort. In order to cope with this a further 12,765 lecture rooms, seminar rooms, work areas were to be created or reconstructed along with 5,181 new accommodation places.[54]

Problems in Implementation

There were problems in the implementation of many of the above measures, however, in that the time frame envisaged for most of the changes was too restricted. By 1984 the Ministry for Energy and Material Economy was already complaining about the slow pace of the upgrading of the *Fachschulen* to *Fachhochschulen* given the urgent need for more graduates in the economy[55] and the new integrated institutions were not anticipated to be operational until the Five-Year-Plan period 1991 – 1995.[56] Moreover, there was simply not enough money available in the struggling economy to bring all the plans to fruition. The economy was in crisis, partly as a result of the repercussions of the 1979 oil crisis. While oil prices returned to normal in much of the world at a relatively early stage, the GDR was tied into a five-year agreement with the Soviet Union at vastly inflated oil prices, exacerbating the effects of the rapidly escalating sums of money being spent on social welfare programmes. Moreover, Russia's decision to cut its supplies of subsidised oil had a severe impact on one of the GDR's main sources of hard currency income from its re-export.[57] The underinvestment in the higher education system was apparent in the working and living conditions in all of the higher education institutions where there were constant complaints of poor maintenance, poor food, heating problems, insufficient teaching rooms and living accommodation, a lack of protective clothing and equipment and, particularly in the medical *Hochschulen*, too few technicians.[58] The implications of this in terms of the

[53] 'Entwicklung der Universitäts- und der Hoch- und Fachschulen der Hauptstadt der DDR, Berlin, 1986 und darüber hinaus', 18.7.1985, SAPMO DY 53/1085
[54] *Protokoll des XI.Parteitages der SED*, pp 751, 811 – 812
[55] 'Information über die Einschätzung der Leiter zentraler und territorialer Staatsorgane zu den bisherigen Ergebnisses der Aussprachen zur Konzeption in ihrer Verantwortungsbereichen', 20.1.84, SAPMO DY 53/1085
[56] 'Konzeption für die Gestaltung der Aus- und Weiterbildung der Ingenieuren und Ökonomen in der Deutschen Demokratischen Republik', 23.6.83, SAPMO DY 53/1090
[57] Kopstein, *The Politics of Economic Decline in East Germany*, pp 96 - 100
[58] 'Einschätzung der Plandiskussion im Organisationsbereich der Gewerkschaft Wissenschaft', 15.8.84, p 7, SAPMO DY 53/1152

recruitment and retention of teaching staff and students is obvious, while teaching and research were necessarily handicapped by the conditions in which they were performed.

Continuing Education

A further measure taken to increase the general level of technical knowledge in the workforce involved the expansion of distance learning and the policy of continuous training for cadres throughout their working lives. While the cadres were supposed to undertake this for six months in any ten-year period, it often appeared to be honoured more in the breach than in the observance. The courses mostly covered subjects such as electrotechnology, microelectronics and "Hardware, Software and Work on the office computer" although a significant number were ideological in nature such as Dialectical and Historical Materialism, Scientific Socialism and the Socialist Organisation of the Workplace.[59] Most of these were to take place in the existing institutions of higher education. However, the coordination of supply and demand was somewhat inefficient with, for example, only 16 of the 60 courses offered at Ernst-Moritz-Arndt University actually running due to lack of numbers, while conversely, 57 courses had to be run at the Engineering *Hochschule* in Wismar instead of the planned 34.[60] This level of provision appeared to be exceptional however. There remained constant complaints from industry that employees were unable to perform well enough to achieve Plan targets because they were neither qualified, nor prepared enough to cope with the new key technologies which demanded ever more comprehensive scientific and technical knowledge. Part of the problem seemed to be insufficient provision of further training. A 1988 survey of 350 management cadres indicated that 69.8 percent would be willing to undertake further training and a further 13.8 percent would consider it if the opportunity were presented, although up to that point, it had not been.[61] The *Hochschulen*, on the other hand, complained that the extra teaching burden was compromising the potential for the research necessary for technological, and hence economic, progress.[62] The implication, then, is that the planning system was not working efficiently. Not only was capacity inadequate for demand, the provision which did exist was insufficient to cope with the pace of

[59] 'Information über Inhalt, Verlauf und Ergebnisse des gewerschaftlichen Mitgleiderversammlung', 2.6.86, SAPMO DY 53/1141
[60] 'Ergebnisse, Erfahrungen und Probleme bei der gewerkschaftlichen Mitwirkung zur Umsetzung des Politbürobeschlusses vom 10.9.1985 "Gestaltung ökonomischer Beziehungen der Kombinate der Industrie mit den Einrichtungen der AdW sowie des Hochschulwesens"', 28.2.86, p 5, SAPMO DY 53/1140
[61] Hans-Jochen Jurschik, 'Probleme und Lösungen in der Weiterbildung von Leitungskadern der Industrie', April 1989, p 7, SAPMO DY 53/921
[62] 'Aktennotiz zum gemeinsamen Erfahrungsaustausch der IG Wismut und der Gewerkschaft Wissenschaft zu Fragen Arbeitsweise und Wettbewerbsführung in CAD/CAM Kollektiven and der Bergakademie Freiberg', 3.12.1987, p 6, SAPMO DY 53/1171

technological change. Moreover, the resultant inability of the cadres to work effectively with the new technologies ultimately resulted in the reduced efficiency of the workforce and lower productivity.

Intensification and Rationalisation

The same philosophy which had been applied to industry was also applied to higher education. The intensification and rationalisation of industry had been achieved through the vertical integration of firms into fewer productive units called *Kombinate* (combines). This allowed a much greater degree of centralised control which was supposed to ease the difficulties inherent in trying to coordinate the supply chain, disruption of which was a persistent cause of production bottlenecks. It was also intended to revitalise industrial performance, stimulate technological innovation and increase export performance. Far from doing this, however, the monopolies on production created by the restructure militated against incentives to innovate or modernise, and East German goods became progressively less competitive on the international market, even in the machine-building sector which had traditionally been strong.[63]

Applied to higher education and research, intensification was defined thus:

> By the intensification of the processes of scientific work, we usually mean an increase in productivity and effectiveness, i.e. the improvement of the connection between the resources of society for the execution of the processes of scientific work and their productiveness in the form of scientific results and their transformation into scientific, technical, economic and social effectiveness [64]

Translated, this meant the achievement of a substantial increase in fundamentally new scientific discoveries in the main priority areas of the economy for a relatively much smaller outlay. Consequently, a number of steps were undertaken. A review of academic research projects took place and the planners trimmed 532 months from 58 different research projects while scientists were compelled to abandon anything which might be considered "hobby" research and were forced into an even narrower concentration on

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[63]Kopstein, *The Politics of Economic Decline in East Germany*, pp 96 - 100

[64] Günter Kröber, 'Intensivierung der wissenschaftlichen Arbeit und subjektiver Faktor', address to the international symposium *Intensivierung der wissenschaftlichen Arbeit* of the Berlin regional centre of the World Federation of Scientists in Varna, 12 – 13 June 1983, pp 1 – 2, SAPMO DY 53/1167

planned foci.[65] Applied research projects were to be completed within a mandatory three years and basic research within four.[66] Efforts were made to encourage the policy of intensification by the implementation of 'the performance principle' and "moral and material stimulation" through a system of bonus payments instituted in 1978. For example, in 1984 higher education teachers could earn an extra 1,000 – 1,500 marks for excellence in the presentation of lectures. Excellence in leading seminars could earn them between 600 and 1,000 marks and the designation of 'excellent educator' could lead to a similar amount.[67] Similar arrangements were in place for the achievement of scientific results both in the *Hochschulen* and the *Akademie der Wissenschaften*. However, having instituted the system in 1978, the Party had apparently never provided the *Hochschulen* with any extra funding to pay for it with the result that, as a policy it "lost its effectiveness over the course of the years".[68]

Intensification and rationalisation was also the rationale behind several other developments in the *Hochschulen*. These included increased collaboration between FDJ student collectives, FDJ brigades and the brigades of socialist work in industry, with the aim of creating strong links between FDJ seminar groups and work collectives so that academic research was even more firmly focused on the needs of the firm. Another involved changing the focus of teaching from a concentration on improving the performance of weaker students to the identification and support of the brightest.[69] In a 1980 article for *Die Pädagogik*, the Director of the Institute for Theory, History and Organisation of Science argued the need to design education and training to recognise the existence of and encourage a "greater density" of particularly intelligent youngsters in science and production because "Our society cannot afford to neglect a single talent and leave it to atrophy".[70] The *Hochschulen* were mandated to single out particularly gifted youngsters who could form a reserve of cadres with the potential to become leading academics or scientists.[71] These high achievers were encouraged by means of specially designed individual study plans, exchange visits to other *Hochschulen*, spending part of their study

[65] 'Information über das gewerkschaftliche Mitgliederleben in den Monaten Januar und Februar 1982', SAPMO DY/1069
[66] 'Maßnahme des ZVs der Gewerkschaft Wissenschaft zur Führung der Plandiskussion 1984', SAPMO DY/1167; Irmer H. and Wilms B., 'New Forms of Co-operation for Research in the German Democratic Republic between Higher Education Institutions and Industry', in *Higher Education in Europe*, Vol.9, No.4, 1984
[67] Vorlage Nr. 6/84, 'Erfahrungen und Ergebnisse bei der Durchsetzung des Leistungsprinzips', 23.1.84, SAPMO DY 53/1148
[68] Letter from Menicke, Sekretär des ZVs to AGC Vorsitzender Wegener, Zentrum für wissenschaftlichen Gerätenbau, Akademie der Wissenschaften der DDR, 2.12.88, SAPMO DY 53/922
[69] Horst Weber, *Protokoll des IX. Parteitages der Sozialistische Einheitspartei Deutschlands*, Vol. 2, p 112
[70] G. Kröber, cited in Oskar Anweiler, 'Bildungssyteme in Osteuropa – Reform oder Krise?' p 14
[71] 'Rede von Erich Honecker vor der 1. Kreissekretären der SED', 18.3.80, SAPMO DY 53/1167

time in other socialist countries (usually Russia) for which they received special political-ideological and language training, as well as by collaborating with Young Researcher Collectives in the industrial combines.[72] However, the policy, inevitably, was restricted to those students who demonstrated sound ideological convictions, thus arguably excluding many fine academic brains. Moreover, the principle of the differentiated treatment of students did not correspond to the socialist concept of equality of opportunity and this became a significant source of societal dissatisfaction. It was seen as economically expedient pragmatism and a betrayal of proletarianism: the reproduction of social differences with, coincidentally or otherwise, the social advantage being largely restricted to the offspring of an aristocracy of the Party faithful.[73]

Other methods employed included the institution of performance comparisons (*Leistungsvergleiche*) between the institutions of higher education, over and above the existing 'socialist competition' in higher education, in the face of "considerable reservations on the part of rectors and the directors of the sections, institutes and clinics".[74] *Leistungsvergleiche* were based on criteria such as the planned placing of graduates into specific branches and areas of the economy; teaching loads; high numbers of graduates or those continuing to postgraduate study; the supervisory load of individual professors; the punctual completion of doctorates; the number of manuscripts of textbooks, monographs, research reports and studies submitted; the assessment of the number of patents and inventions per cadre; early or timely achievement of the goals in science and technology mandated by the state and numerous others including the more intensive use of machinery and instruments. For example, certificates were awarded to institutions for being designated "*energiewirtschaftlich vorbildlich*" (exemplary in energy saving).[75] The idea was that these criteria should be a guide to the "consequent enforcement of the socialist performance principle" and that best practice (as demonstrated by the competition 'winners') would then be adopted on a mass scale.[76]

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[72] 'Direktive für das Studienjahr 1983/84 an den Universitäten und Hochschulen der Deutschen Demokratischen Republik', 15.6.83, p 4, SAPMO DY 53/1086; 'Vorlage für das Sekretariat Nr 27/86', Berlin 6.3.86, p 3, SAPMO DY 53/1140

[73] Anweiler, 'Bildungssyteme in Osteuropa – Reform oder Krise?', pp 15 – 16

[74] Letter from Rinke to Böhme, 19.5.83, SAPMO DY 53/1086

[75] 'Information über das gewerkschaftliche Mitgliederleben im Zeitraum Mitte Februar bis Mitte März 21.3.88', SAPMO DY 53/1101

[76] 'Gemeinsame Orientierung des ZVs der Gewerkschaftwissenschaft und des Ministeriums für Hoch- und Fachschulwesen zur Führung von Leistungsvergleichen an den Universitäten und Hochschulen', 1983, SAPMO DY 53/1086; letter from Rinke to Böhme, 222.5.84, SAPMO DY 53/1085

Research in Higher Education

Between 1985 and 1987 there was a further substantial increase in state funding for R&D in the *Hoch- and Fachhochschulen* amounting to a little over 21 million marks, consistent with massive increases in overall R&D funding.[77] Of this, much the biggest proportion was spent on research and production in microelectronics (around 3.7 billion marks in the same time period). By contrast, R&D in machine-building received around 1.9 billion marks and R&D in chemicals less than 1.6 billion. The total number of R&D personnel increased from 128,785 in 1985 to 131,873 in 1987 and 132,341 in 1989, of which the proportion employed in the higher education sector increased from 10 percent to 10.4 and 10.6 percent respectively.[78] The planners also allocated new research priorities for individual institutions. For example, the *Technische Universität* Dresden, *Technische Hochschule* Karl-Marx-Stadt and the *Technische Hochschule* Magdeburg were to become centres for training and research into CAD/CAM in the metal processing industry. Dresden also became a centre for the teaching of employment-oriented studies in electrotechnology, while research into information technology was to become a focus in the University of Rostock, the *Technische Hochschule* Ilmenau, the Engineering *Hochschule* at Dresden as well as in the universities of Magdeburg and Karl-Marx-Stadt.[79]

Underinvestment

One of the main problems encountered was that of underinvestment. Foreign currency for the import of expensive research equipment was extremely scarce. The amount allocated fell from around ten million valuta marks[80] in 1976 to zero in 1983, where it remained until 1986 when around seven million valuta marks were again made available. Over the course of the 1980s the *Hochschulen* received less than 5 percent of the machine tools they needed for research and in 1989 only around 12 percent of the foreign currency they required to buy research equipment. Hence, the proportion of *Hochschulen* which estimated their research equipment as of comparable standard to that of other countries fell from 55 percent in1979 to ten percent in 1982.[81] A report for the Council of Ministers on research technology in 1986 intimated that fifteen percent of larger-scale research

[77] *Statistisches Jahrbuch der Deutschen Demokratischen Republik*, 1990, pp 264 – 265
[78] Bentley, *Research and Technology in the former German Democratic Republic*, pp 50, 77 and 81
[79] 'Direktive für das Studienjahr 1985/86 and der Universitäten und Hochschulen der DDR', in SAPMO, DY 53/1085
[80] Unit of account for GDR foreign trade purposes. The rate of exchange depended on the value of the transfer ruble used by the Soviet Union
[81] Bentley, *Research and Technology in the former German Democratic Republic*, pp 104, 106

equipment was more than ten years old, 19 percent more than fifteen years old and 52 percent of smaller –scale equipment was more than ten or fifteen years old. Equipment imported from socialist countries frequently proved itself unsatisfactory and there were, in any case, problems in accessing equipment and expertise from the Soviet Union because of their militarily sensitive nature. Moreover, a trade embargo, which had been imposed on the Soviet bloc for strategically important products by COCOM[82] tightened even further, pushing prices up significantly and resulting in a fall in the import of research equipment from the early 1980s to 1990. A further survey in1990 highlighted the fact that even when newly acquired, equipment was technologically at least five years behind that of the West.[83]

Many academic research facilities, such as those of the Universities of Jena and the Humboldt were therefore forced to devote a substantial amount of their research capacity to the development of scientific instruments for themselves and for other *Hochschulen* and scientific institutions because, as the rhetoric of the Party had it: "Commercial instrument technology alone will, in the long term, only lead to middling achievements".[84] Thus, in 1984 827 instruments of 63 different types were produced: an increase from the 1983 figures of 267 of 25 types. The corollary to this was, of course, that this work took up time, resources and personnel skills which could have been otherwise employed on the research into the main economic priorities.[85]

In 1987 for the first time the contracts negotiated between industry and higher education institutions included basic research as part of their common remit in a "new form of bilateral exploitation of material and intellectual potential".[86] The main reason, according to the authorities, was to promote the rapid development and comprehensive use of the key technologies of microelectronics, modern computer technology, computer-aided project and production design, flexible manufacturing systems, new processing technologies, new

[82] COCOM was the Coordinating Committee for Multilateral Export Controls established in 1947 to place an embargo on certain militarily sensitive Western exports to Eastern Bloc countries
[83] Bentley, *Research and Technology in the former German Democratic Republic*, pp 101 - 107; Förtsch, 'Science, Higher Education and Technology Policy', p 311, ff 20
[84] Vorlage Nr. 10/84, 'Konzeption für die Erarbeitung des Referats der 9. Zentralvorstandstagung', 17.1.1984, SAPMO DY 53/1148
[85] 'Ausführungen zur Auswertung der Jahresforschungsberichte 1984 auf der Dienstberatung des Ministers für Hoch- und Fachschulwesen mit den Rektoren der Universitäten und Hochschulen am 3. Mai', SAPMO DY 53/1085, 7.5.85, pp 15 – 16; Zuarbeit zum Referat für die 13. Bundesvorstandstagung 12.11.1985, SAPMO DY 53/1090; Steiner, Von Plan zu Plan, p 209
[86] 'Information über Inhalt und Ergebnisse eines gemeinsamen Erfahrungsaustausches', SAPMO DY 53/1171, 1987, p 2

materials and the new biotechnologies.[87] Regarding its collaboration with the Friedrich-Schiller-Universität Jena, the combine ZIMET Jena stated:

> Because our socialist DDR can only be further strengthened through intelligent thinking and concrete action, we are undertaking further obligations/duties which are directed, above all, at additional results in basic research[88]

However, although the 'industrial partners' were supposed to provide the *Hochschulen* with the necessary instruments/machinery to perform the research projects they had contracted with them, this proved problematic as firms, once again, appeared to be "insufficiently ready to commit themselves to common, long-term strategies – above all to basic research" which was of no short-term benefit to the firm.[89] The GDR was forced, therefore, to rely on developing technology by the "reverse engineering" either of technology acquired illegally or semi-legally by Koko (*Bereich Kommerzielle Koordinierung* or Sector for the Coordination of Commerce) at a very high price, or the copying of older technology, the components for which were widely available in both East and West. However, the machinery thus produced was inevitably obsolete before it hit the market. [90]

Scientific Isolation

A further problem lay in the scientific isolation of East Germany from the West. With conference visits strictly confined to trusted party members only, conversation with non-socialist visitors limited to restricted topics only, and the constant supervision of the Stasi, the only access the GDR scientists had to Western science (at least until the signing of the agreement on scientific cooperation between the two Germanys in1987) was via permitted scientific publications. Predictably, though, the GDR could not afford to buy as many foreign publications as were required. Photocopies were severely limited because of a scarcity of machines, due both to production difficulties and because the authorities feared they would foster the spread of subversion. Additionally, the publication of domestic research was hampered by excessive secrecy regarding anything which might be

[87] 'Zuarbeit zum Referat für die 13. Bundesvorstandstagung', 12.11.1985, SAPMO DY 53/1090
[88] 'Ergebnisse und Erfahrungen bei der politischen Führung des sozialistischen Wettbewerbs zu Ehren des 11. FDGB-Kongresses, 1987', SAPMO DY 53/1089
[89] Harry Tisch, 'Aktennotiz über die Konsultation zum Plan '89 der AdW bei der SPK', 11.11.88, p 2, SAPMO DY 53/1171
[90] André Steiner, *Von Plan zu Plan*, p 182; for a fuller discussion see Stokes, *Constructing Socialism*, chpt 7; Kristie Macrakis, 'Espionage and Technology Transfer in the Quest for Scientific-Technical Prowess' in Macrakis and Hoffmann (eds), *Science under Socialism: East Germany in Comparative Perspective*, chpt 4

considered industrially or politically sensitive, or because of the purported ideologically unsound character of the scientist(s) involved.[91] Crucially, though, yet another reason appeared to lie in the difficulty of persuading some party officials that there actually was a need to achieve international competitiveness in science and technology.[92]

Hochschulen v. Akademie der Wissenschaften

The performance of research in the *Fachhochschulen* and *Hochschulen* was also hampered by the Party's perception of the *Akademie der Wissenschaften* as the main performer of academic research and particularly of basic research, although it also undertook applied research which had been contracted by industry or the state. By 1989 the Academy boasted 18,285 persons directly employed in R&D compared to 14,088 in the higher education sector. The Academy also had the power to confer doctorates and arguably siphoned off the cream of academic talent in the country as well as the major portion of state R&D funding from the state. The *Hochschulen* were responsible for the majority of industrial research, but unlike the scientists in the Academy were also forced to contend with much more rigid organisational structures as well as the time constraints imposed by long teaching years, student overcrowding and a high level of administrative tasks. Thus, the research effort in the *Hochschulen* was considerably handicapped in comparison to that in the Academy. In some cases this led to the perception that the institutions had become divorced from the principle of the unity of teaching and research and performed only a teaching function. Bentley argues, however, that while most research on informatics, biosciences and in newer, emerging sectors took place in the Academy, most of the academic research in classical engineering and 22 percent of that in physics took place within the *Hochschulen*. Mathematics and the natural sciences were also well represented, although medicine and the humanities considerably less so. The *Fachhochschulen* focused almost exclusively on industrial research projects, but underfunding and high teaching and administrative burdens also hindered research efforts there.[93]

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[91] Bentley, *Research and Technology in the former German Democratic Republic*, pp 95 – 101
[92] Bruce Kogut and Udo Zander, 'Did Socialism Fail to Innovate? A Natural Experiment of the Two Zeiss Companies', Working Paper 98-3, Carnegie Bosch Institute, 1998, http://cbi.tepper.cmu.edu/papers/cbi_workingpaper-1998_03.html (accessed 12.9.2007), p 17
[93] Bentley, *Research and Technology in the former German Democratic Republic*, pp 80 – 85; Förtsch, 'Science, Higher Education and Technology Policy', pp 37 – 40

Despite the problems outlined above, GDR statistics point to a serious research effort with substantial results in terms of patents granted. The following table demonstrates the number of total reported inventions for the years 1985 and 1986:

Table 6.5

Total reported inventions from GDR academic institutions for 1985 and 1986

	1985		1986	
MHF[1]	1,944		2,021	
AdW[2]	1,062		1,021	
AdL[3]	205		231	
Of which in collaboration with industry/practice				
MHF	830	42.7%	927	45.9%
AdW	282	26.6%	282	27.6%
AdL	36	17.6%	38	16.4%

[1]Medical Academies, Universities, *Hochschulen* and *Fachschulen*
[2]Academy of the Sciences
[3]Academy of Agricultural Sciences

Source: Ergebnisse der Erfinder- und Neuertätigkeit des Jahres 1986, SAPMO, DY 53/1089

It is difficult to be certain about the effectiveness of the research effort, however. Firstly, neither the above table, nor the document to which it pertains, contain any details as to the nature of the inventions. Bentley points out, however, that many of these apparent inventions were simply minor product or process improvements, or were redevelopments of existing Western technology. Moreover, the numbers were further padded by the breaking down of research projects into much smaller individual areas. Any small development in any area or of any component, therefore, would also count as a new invention.[94] In an address to the rectors of the universities and *Hochschulen* in 1985, the Minister for Technical and Higher Education waxed lyrical about 243 new inventions which had earned around 48 million marks for the economy in their first year of use but the utilisation rate of most of the new inventions was apparently small: on average, only 28 percent of the MHF applications, seven percent of the AdW applications and fifteen percent of the AdL applications were taken up by the economy. Of 1,094 patents registered to all East German *Hochschulen*, only 44 included effective new principles, of

[94] Bentley, *Research and Technology in the former German Democratic Republic*, pp 20, 85

which only six were of use to the main priorities of the economy.[95] Moreover, the Statistical Yearbook shows a declining trend in the numbers of patents applied for and granted to GDR *Hochschulen* between 1985 and 1988.[96] The official hypothesis was that the planning of inventions was not yet sufficiently geared to the thematic foci of the economy and to the achievement of concrete goals.[97] This could, arguably, have been due to the high degree of focus on industrial research in higher education. However, a further report from 1988 stated that only three of a total of 56 patents registered by the Karl-Marx University in Leipzig were of practical use to its partners in industry, suggesting that the *Hochschulen* may indeed have been attempting to gear their efforts more towards national economic priorities rather than those of local industry.[98]

An examination of all patents applied for by the GDR in Europe over the period 1979 – 1988 appears to indicate that the GDR's strengths lay in paper and printing, textiles, machine tools, handling technology, optical instruments, measuring technology and food. It was particularly weak in a number of areas, most significantly electronics, communications engineering and information technology: precisely the areas it had targeted for priority development.[99] In 1985 the GDR Minister for Higher and Technical Education was unequivocal in his estimation of the unpreparedness and inability of all research establishments to cope with the research and development of a fifth generation of computers which was well underway in other countries.[100] The directives of the 11th Congress of the SED in 1986, therefore, called for the redrafting of all programmes for the general and advanced training of engineers, economists, technologists and scientists before 1990 in order to remedy this. It also intensified demands to concentrate academic research on microelectronics, robotics and computer and information technology in order to effect the introduction of large-scale automation throughout industry which would, in theory, increase labour productivity by 400 – 500 percent and reduce the cost of materials by up to 40 percent.[101]

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[95] 'Ergebnisse der Erfinder- und Neuertätigkeit des Jahres 1986, Sekretariatsvorlage Nr. 147/87, 26.5.87', SAPMO DY 53/1089
[96] *Statistisches Jahrbuch der DDR*, 1990, pp 130 – 132
[97] 'Ergebnisse der Erfinder- und Neuertätigkeit des Jahres 1986, Sekretariatsvorlage Nr. 147/87, 26.5.1987', SAPMO DY 53/1089
[98] 'Information über das gewerkschaftliche Mitgliederleben im Zeitraum Mitte Februar bis Mitte März', 21.3.88, SAPMO DY 1101
[99] Bentley, *Research and Technology in the former German Democratic Republic*, pp 115, 135 – 136
[100] 'Ausführungen zur Auswertung der Jahresforschungsberichte 1984 auf der Dienstberatung des Ministers für Hoch- und Fachschulwesen mit den Rektoren der Universitäten und Hochschulen am 3. Mai', 7.5.85, pp 10, 13, 17, SAPMO DY 53/1085
[101] *Protokoll des XI. Parteitages der SED*, pp 81, 287 – 288, 811

Overall, Bentley concludes that the GDR was much weaker than West Germany in terms of academic research of international standard and, despite its heavy focus on applied, industry-oriented research, was considerably weaker in this too. Moreover, he cites the Max-Planck Society's view that the gap between East and West German science matched, if not exceeded the economic gap between the two. One further reason advanced for the lack of technical progress demonstrated by the GDR was the bias in trade concentration on the Comecon countries, especially the Soviet Union. The sure market for products there, accompanied by the virtual absence of competition, led to a tendency to adapt to a lower level of development.[102]

A second point which deserves consideration is how the concentration on applied research and product development for industry in the *Hochschulen,* affected the development of human capital. Koeshall has argued that the higher education system in East Germany did not predispose its students to develop advanced critical thinking skills because of the inherent rigidity of the ideological instruction received and because of the over-narrow focus of the specialisms in the scientific and technological disciplines.[103] Hence, the sort of research which required well informed and wide-ranging critical thought was bound to suffer. As we have seen, however, it would be hard to attribute the GDR's less than stellar contribution to international academic research solely to pedagogical failure. Moreover, because we are considering the contribution of human capital development to economic growth, it would be possible to make a case that the contribution made by higher education research to product and process development in local industry could have proved at least as beneficial to the economy as the government's insistence on developing high technology sectors which, for so many reasons, it was unsuited and ill-equipped to develop. Macrakis makes the point, however, that the policy of using reverse engineering technology to try and compete in the high technology sector was not only demoralising to East German scientists, it also inhibited creativity and ultimately promoted laziness in the pursuit of innovation.[104] The same could also be said of a system which forced a large proportion of the teaching and research effort of the *Hochschulen* to focus so narrowly on the short-term (and arguably also short-sighted) requirements of local industry instead of developing wider, longer-term and more theoretical perspectives.

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[102] Leptin and Melzer, *Economic Reform in East German Industry*, pp 7 - 8

[103] John Frederick Koeshall, 'The Effects of the Marxist-Leninist Educational System on the Thinking Abilities of East German Students', PhD submitted to the School of Intercultural Studies, Biola University, 2002; Bentley, *Research and Technology in the former German Democratic Republic*, pp 94, 98 – 100, 107

[104] Kristie Macrakis, 'Espionage and Technology Transfer in the Quest for Scientific-Technical Prowess' p 119

The Endgame

The Economy

The high levels of investment in high technology inevitably led to the neglect of less technologically sophisticated areas within the economy in which it could have been more competitive.[105] In 1988 the UN Economic Bulletin highlighted the downturn in exports to the West of machinery, consumer goods and, most particularly chemicals, in which East Germany had hitherto enjoyed a competitive advantage.[106] In many cases, exports to the West were sold at prices well below cost simply to ensure a supply of hard currency with which to service a national debt which was spiralling completely out of control.[107] Despite the enormous levels of investment in them, the new technologies represented only a very small proportion of the economy and even had they reached the ambitious growth targets laid down in the 1986 directives, they could not have been expected to have a major effect on other sectors of the economy in the short term.[108] Faced with the wholly unachievable necessity of running an estimated DM 6.5 billion trade surplus with the West every year in order to service its debt, Finance Minister Schürer advocated a radical cutback of consumer price subsidy as the only means of rectifying the situation. The Central Committee, however, threw out the plan on the grounds of its irreconcilability with socialist economic and social policy.[109] Shortages of even the most basic consumer goods within the GDR worsened despite imports of Western capital goods more than doubling between 1985 and 1988 [110] and open discontent over economic conditions was becoming more and more apparent while demands for greater liberalisation within society increased.

Social and Academic Unrest

Levels of disaffection also became increasingly apparent throughout the higher education sector, both among staff and students, and the situation deteriorated rapidly towards the end of the decade. For example, meetings of the academic trade union were hijacked by staff and students to discuss why the country was so much in debt to the FRG; what, if there was no acid rain in East Germany, was affecting the forests so badly; the high fat

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[105] Stokes, *Constructing Socialism*, pp 193 - 194
[106] *United Nations Economic Bulletin for Europe*, 1988, Vol. 40, No. 3, p 388
[107] Kopstein, *The Politics of Economic Decline in East Germany*, pp 96 – 100
[108] Doris Cornelsen, 'The GDR economy at the turn of 1986/87', DIW Wochenbericht 5/87, http://www.springerlink.com/content/y632w0p210224j8q (accessed 20.2.2008), p 9
[109] Maier, *Dissolution*, p 106
[110] *United Nations Economic Bulletin for Europe*, 1988, Vol. 41, p 34

content of sausage products; the poor quality and unfashionable design of shoes, textiles and other consumer goods; the shortages of basic medicines; and the delays in being called for medical tests and procedures. Academics at another *Hochschule* asserted that it would be more honest if the media, without denying the successes of the GDR, also acknowledged the country's problems.[111] Organisations within the *Hochschulen*, such as the *Jugendkommission* of the academic trade union were having increasing difficulty in recruiting students to act as functionaries while others reported that members "were not taking their positions seriously".[112] The general impression obtained from the primary sources is that the authorities were increasingly disconcerted by events. In the absence of any other obvious solution, the state's response was an attempt to crack the ideological whip even harder. Open dissidence was severely punished and motivational events arranged to debate subjects such as "the optimal development of the personality in the educational process taking particularly into account the demands of the scientific and technological revolution".[113] Trade union influence was brought to bear on higher education teachers to remind them of their "great responsibility", their "creative relationship" with students and the need for "the achievement of a creative atmosphere … in order to deal with the new demands and their associated ideological problems".[114]

As general social dissidence increased, however, in the absence of Soviet willingness to provide military support as in the past, it was impossible to enforce what Günter Mittag described as "the primacy of the social over the majority of individual interests".[115] In the end, the opening of the borders to the West in Hungary sealed the fate of the GDR, precipitating the fall of the Berlin Wall and reunification with West Germany.

Conclusion

The effect of changes in higher education on economic growth is obviously impossible to quantify precisely. There are, nevertheless, a number of points which can be made.

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[111] Reports of meetings at the Technische Hochschule Magdeburg and the Pädagogische Hochschule Güstrow in 'Gewerkschaft Wissenschaft ZV Sekretariatsvorlage nr. 31/86', 17.3.86, p 2, SAPMO DY 53/1090

[112] 'Bericht der Jugendkommission des ZVs zu ihrem Beitrag bei der Verwirklichung der Aufgaben der 9. Zentralen Delegiertenkonferenz', 17.4.89, pp 4 – 6, SAPMO DY 53/921

[113] 'Ausschreibung zur 5. Zentralen wissenschaftlichen Konferenz der FDG-Studenten und jungen Wissenschaftler lehrbildender Einrichtungen der DDR', 12.2.87, SAPMO DY 53/1098

[114] 'Konzeption zur Vorbereitung der Berichterstattung und Erarbeitung der Vorlage für das Präsidium des Bundesvorstandes des FDGB', 21.8.88, SAPMO DY 53/1101

[115] Günter Mittag, cited in Betz, ‚East Germany: The Primacy of Dogma over Reform', p 90

Firstly, its contribution to economic growth was considered important enough that a great deal of governmental time, effort and rhetoric was devoted to it. Secondly, higher education institutions were responsible for the training of the vast majority of those employed in the larger research effort as well as of virtually all the leading cadres in the people's economy. Thus, the restrictions on student numbers because of an apparent lack of appropriate employment most certainly had an disadvantageous effect on the pool of academic research talent available to the economy and of technicians and the innovative potential available to industry, as well as fomenting a great deal of social discontent among the young because of their reduced opportunities. Moreover, even though the policy was reversed in 1976 in order to produce more graduates in the areas of the key technologies, student numbers maintained an overall downward trend thereafter, though this is partly explained by demographic developments.

Thirdly, the quality of the teaching was obviously as critically important to the economy as were the subject areas prioritised by the planners. (By 1988 the numbers studying the technical sciences (41, 700) simply dwarfed any other area of study including economics (17,336), medicine (12,954) and mathematics and the natural sciences (8,401)).[116] However, much of the teaching was formulaic and subject specialisms were constantly narrowed involving a risk of rapid technical obsolescence. The virtual exclusion from much of the published scientific work of western scientists because of the risk of ideological subversion was exacerbated by restricted access to much of the scientific material published in the GDR, especially in priority areas such as microelectronics. Moreover, the GDR's tendency to appoint senior teaching and research personnel on the basis of political reliability rather than scientific ability does not necessarily inspire confidence in their intellectual achievements or that the results in terms of effective education were optimal.

It would be wrong, however, to dismiss the humanities as irrelevant to GDR higher education. As the files of the *Kulturbund* (Cultural Association) and the *Institut für Marxismus Leninismus* make very clear, the GDR was also anxious to establish a presence as a cultured and civilised country albeit within the fairly narrow parameters of the East German vision of socialism. There was, for example, much emphasis on the better integration of 'suitable' art, classical and folk music, dance and literature into the *Hochschulen* as an essential factor in the development of class-consciousness, and the need

[116] *Statistiches Jahrbuch der DDR*, 1990, p 316

to utilise the potential of higher education institutions for the development of the intellectual and cultural life of the whole country.[117] Moreover, a thorough education in the history of socialism and philosophy in the form of Marxism-Leninism was considered critical for the full development of the socialist personality. However, the humanities were never allowed to assume the prominence which they did in West Germany and the primary function of the *Hochschulen* (and of the good socialist personalities created there) was seen as being of service to the economy.

Fourthly, although basic research was initially promoted more strongly in the *Hochschulen* following Honecker's accession to power, this position was largely reversed as economic necessity dictated the need for industry to take responsibility for the majority of the financing of research in the *Hochschulen*. Thus, the facilities in the *Hochschulen* were once again put to use in the fulfilment of the combines' production targets. It was not until the late 1980s that real emphasis began to be put upon the sort of basic research which might lead to technological breakthrough, and even then this was hampered by the unwillingness of the 'industrial partners' to fund it when the perspectives were so long term and the benefit to the individual firm was uncertain. Moreover, because of the increasing impoverishment of the country, the government was forced to severely restrict the amount of foreign currency given to higher education institutions to purchase necessary research equipment from the West. This, combined with the 'intensified use' use of outmoded, existing equipment well beyond its intended service life meant that research in the higher education sector was operating under an almost insurmountable disadvantage and was unable to achieve the sort of results dictated by the planners. That said, higher education's contribution to the GDR research effort was smaller than that of the *Akademie der Wissenschaften*; however, similar strictures affected all research institutions in the GDR.

GDR *Hochschulen* were not, then, the bastions of learning dedicated to producing the best from each individual student and researcher portrayed in the literature of the SED. Rather they were ideologically hamstrung, cash-strapped institutions with an overburdened teaching body, too narrowly focused on a few key and ultimately unachievable technologies and on the practical problems of individual industrial and agricultural

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[117] See for example, 'Ergänzungsvorschlag für unsere Stellungnahme zum Entwurf der Kommission über die Weiterführung der 3. Hochschulreform', 18.2.1969 and 'Nachgereichter Diskussionsbeitrag zur Sitzung des Präsidialrates am 21.2.1969', both in SAPMO DY 27/7558

collectives. They were also subject to violent swings in educational policy. The state, therefore, failed to make optimal use of higher education and compromised its potential contribution to the economy. Nevertheless, as a number of commentators have pointed out, GDR engineers were well trained; GDR academics produced a number internationally well-regarded textbooks and publications; and the research conducted in the *Hochschulen* was regarded far more highly by international observers than the GDR's industrial R&D, even if ultimately regarded by the GDR itself as "mediocre" on the international scale.[118] The GDR's lack of economic success was far more a result of the political, economic and cultural rigidities of the socialist system as practised in East Germany. The decisions of the planners were not necessarily based on economic criteria and poor planning decisions led to an overwhelming emphasis on high technology sectors where there was little chance of the GDR ever becoming competitive, thus neglecting the lower-tech industries where it might have stood some chance. Lack of competition in the industrial field gave no impetus to competitive, innovative activity resulting in low productivity, inefficiency and the manufacture of products which became increasingly unsaleable on the international market. Moreover, tradition, labour law, class and gender bias prevented the absorption of graduate level personnel into positions in industry where they might have made a difference. The massive outlay on high-tech research programmes only added to the strain of an economy already stretched to breaking by the repercussions of the 1979 oil crisis and the GDR's extensive social welfare programmes.

[118] East German report on 'Lehre, Forschung und Weiterbildung in der DDR', June 1990, cited in Bentley, *Research and Technology in the former German Democratic Republic*, pp 114 – 115; Förtsch, 'Science, Higher Education and Technology Policy', p 41

Chapter 7

Conclusion

The story of this thesis has been in essence about the development of higher levels of human capital in two very diverse social and political systems, the means chosen to achieve this and their impact on economic growth in both states. It proceeds from the hypothesis that the technological progress theory of economic growth is valid: that investment in human capital development will result in increasing returns to scale and thus will have economic benefits for a country by enabling increases in productivity and growth. In other words, that long-term economic growth fundamentally depends on the ability of human capital development to produce the new ideas and technologies necessary for such growth.

The ability of a society to generate its own technological innovation is likely to be economically beneficial in several respects: for instance, in terms of being first to market, improved productivity and the financial benefits accruing from patent rights. There are, moreover, further benefits related to a country's international status and political influence. There can also be little dispute that a rapidly technologising society requires an increasingly well-educated workforce in order to be able to exploit the new technologies and reap the economic benefits of doing so. However, as the literature on human capital development theory also makes clear, investment in education of itself is no guarantee of economic growth: certain preconditions are necessary. In the academic sphere, these include the necessity of expanding the areas most relevant to the development of science and technology; a flexible infrastructure open to new ideas and economic development; competition between individual educational institutions in order to stimulate a more efficient absorption of technological advances into the curriculum, improve teaching and accelerate research efforts; and continued investment in both physical and human capital. Also critical in terms of turning the effects of increased human capital into economic growth are efficient systems of technology transfer; exposure of the economy to the market to allow marketplace competition to encourage innovative activity and the adoption of new technology within industry; and the existence of effective forms of management both in the higher education sphere and in industry in order to optimise the activities of the labour forces of both in response to new technology. In the absence of any of these, increased investment in higher education is unlikely to bring all the rewards anticipated of it.

The story, however, also concerns the relationship between the cultures and traditions of two countries and the development of patterns of education which conformed to the cultural and ideological mores of each, as well as to a more economically-driven agenda. Thus, the impact of the higher education system on economic growth in East and West Germany can be assessed only within the context of the radically different social systems of each state. My thesis has presented a fairly comprehensive overview of the development of higher education in both East and West Germany from 1945 – 1990 in order to highlight, not only the main changes to both systems, but the extent of their general impact on each country in economic terms. This concluding chapter will return to some of the questions posed in the discussions in chapter one of the thesis. I will relate these to both countries' responses to the challenges faced over the period under consideration and will also try to draw some tentative conclusions as to the effects of these changes on the economic growth of both countries.

Questions

The questions raised in the introduction concerned the viability of the re-establishment of the pre-Weimar elite system of higher education and its self-imposed alienation from economic need on the one hand; and the restructuring of higher education according to Marxist-Leninist principles and the enforcement of a strong orientation to perceived economic and societal need on the other. Related to this are the issues of the subjects offered and taught at higher level, the number and type of graduates produced by the respective systems, the quality and orientation of the teaching and research performed in higher education and whether these represented an adequate response to the challenges posed by a rapidly developing technological environment. This, in turn, raises questions with respect to the effectiveness of the control and administration of higher education and the impact of much larger numbers of graduates on the employment markets. The influence of the divergent institutional structure of both countries is also of particular significance, firstly, in terms of how the development of human capital at a higher level was/was not encouraged and secondly, of how the action taken was translated into technological and industrial performance. Ultimately, the questions to be answered are how the effective the respective systems were in developing systems of higher education which which were of benefit to their economic growth and, to some degree, the extent of

the part played by different factors such as levels of investment, industrial forms, patterns of management and social change.

Challenges

Germany's stellar reputation in the training of scientists and in the research and development of science and technology during the nineteenth century was, arguably, based somewhat less on the basic research performed in the traditional university system than on the efforts of the *Technische Hochschulen*, industrial enterprises and a number of independent and state-run research institutes which focused very strongly on applied as well as basic research. The interwar period, however, was characterised firstly by self-imposed partial isolation from the international scientific community during the duration of the Weimar Republic, which Forman has referred to as "the cold war in international scientific relations" with the Allies,[1] and secondly by the National Socialist policy of rigorous isolation from the international scientific community, its focus on the war effort and its rejection of swaths of academic disciplines, particularly the more modern interdisciplinary fields of science such as biotechnology, geophysics and astronomy. The effects of both on German science and technology were harmful, resulting in the opening up of large gaps in more modern technologies between Germany and the USA. There were, therefore, parallels in the situation of West and East Germany in their mutual need to reconstruct their economies, adjust to the limits imposed by new borders and develop an entirely new type of society from the ashes of a fairly disastrous three decades or so. The answer appeared to lie in scientific and technological progress, key to which was the growth and development of higher education.

West Germany

The challenge faced by the federal governments of the FRG, once the initial phase of reconstruction was past, was the development of a higher education system which was more closely attuned to a rapidly developing technological world. This, in effect, meant the democratising and expansion of the highly elitist system which had existed prior to the First World War in order to create sufficient numbers of graduates with the higher level qualifications in the technical sciences needed to re-establish West Germany's presence as

[1] Paul Forman, 'Scientific Internationalism and the Weimar Physicists: The Ideology and Its Manipulation in Germany after World War I', *Isis*, Vol.64, No.2, June 1973, pp 152 – 156

a global industrial and economic power. This, however, had to be achieved within the parameters of a federalised political system and system of administrative control restored by the Allied Powers to prevent the resurgence of a strong central authority capable of initiating another military challenge. The weakness of the authority of the federal government over the individual *Länder* and the consequent bureaucratic and political wrangling posed another serious challenge which was evident in successive attempts to achieve change in higher education. Moreover, the Basic Law (*Grundgesetz*) imposed strictures on both federal and *Länder* governments when it came to controlling the size of the expansion of the sector and in directing students' choice of study discipline.

A change of government in the late 1960s encouraged even wider access to higher education during a period when the size of the relevant age cohorts were increasing rapidly as a result of West Germany's post-war baby boom. The challenges faced in response to this lay in the ability to fund such extensive growth and the channelling of student choice away from studies which would equip them only for increasingly saturated traditional graduate employment markets and towards sectors perceived of as more immediately useful to the economy and where the employment prospects were more certain. As the economic climate worsened through the 1970s and 1980s, an increasingly significant challenge related to the need to make the *Hochschulen* more economically relevant in terms of curricula and the ability to better utilise the results of the research performed there, firstly, by orienting teaching and research projects more closely to the country's main economic priorities and secondly, by improving the transfer of research results to industry for applied use and through the undertaking of contracted research and other cooperative projects with industry and other research institutions.

East Germany

The major challenge for East Germany initially was the restructuring of the higher education system through a considerably more thorough process of denazification than took place in the West; rescinding the autonomy of higher education institutions and achieving central control; the promotion of democratisation through the creation of the *Arbeiter/Bauer Fakultäten* (worker/peasant faculties created within *Hochschulen* to prepare 'workers' and 'peasants' for university level education); and the progressive sovietisation of the system. Given that science and technology had great ideological significance as major tenets of Marxism-Leninism, the aim was to promote these heavily and develop close links to industry in the creation of a Stalinist-type vision of heavy

industry and the pursuit of the scientific-technological revolution. As well as being central to the rebuilding process, an equally pressing aim was the legitimisation of East Germany's status in the world and, in effect, the creation of a centrally planned system which could successfully compete in a global free market environment, proving the superiority of socialism over capitalism. Thus, the goal was first to increase the general educational level of the workforce, thereby prompting innovative development, increasing the general level of productivity and generating economic growth through a steady and centrally planned increase of higher education along lines pre-determined by the economic planners. The second element was the development of research projects which were both financed by, and strongly oriented to industrial and economic development.

Over time, however, the situation changed. Because of declining economic performance and the perception of an excess of graduate engineers for whom there appeared to be insufficient appropriate employment, a new leadership restricted access to higher education, encouraging instead the training of skilled and semi-skilled workers to work in industry producing consumer durables for domestic consumption and for the export market. When this also failed to have the desired economic effect, the subsequent promotion of the high-technology sector again demanded the expansion of higher education in order to produce the theoretically trained technicians capable of this level of work.

As with West Germany, one of the greatest challenges incurred by the GDR was financing the development of higher education. Economic shocks in the form of the fall-out from the oil crises of the 1970s, particularly the second in 1979, coupled with the cost of supporting an over-ambitious system of social welfare and increasing trade deficits greatly intensified the problem of an economy which had been in decline from the end of the 1950s.

Finally, it could reasonably be argued that one of the biggest challenges affecting economic growth and higher education expansion in the East was demographic development. In contrast to West Germany's late onset post-war baby boom, which brought its own problems with regard to the provision and funding of higher education, the population of East Germany showed an almost continuous steady fall right from the country's inception, despite the building of the Berlin Wall and the stemming of an estimated total exodus of around 2,200,000.[2] Thus, attempts to increase participation in

[2] Kurt Sontheimer and Wilhelm Bleek, *Die DDR: Politik, Gesellschaft, Wirtschaft* (Hamburg, Hoffmann und Campe Verlag, 1972), p 193

higher education were bound in the end to reach a finite level as well as affecting the provision of lower-skilled labour in the economy. The answer to compensating for its diminishing population levels depended largely on finding a way to increase labour productivity by means of a better trained workforce capable of creating innovation in the workplace and through the development of new technologies and processes in the research laboratories of the institutions of higher education and the *Akademie der Wissenschaften*.

Responses

The ideological divisions between East and West Germany prompted very different responses to the restructuring of their respective higher education systems and in both cases, a number of issues related to their respective ideologies and institutional structures proved to be unhelpful in terms of encouraging economic growth.

Change and Reform in West Germany

In the West, academia's original aim was the restoration of the societal structure which had existed before WWI and its own role as an aristocratic elite therein. This involved the restoration of traditional academic values within the universities and *Hochschulen*; a return to the traditional faculty structure; the unity of teaching and research; enhancing the autonomy of the academic senates in running the universities; and the primacy of 'pure' scholarship and basic research over more practically-oriented technology and its application. Technology was regarded as the function of the *Technische Hochschulen*, although the senates of these regarded their status and the scholarship practised there as the equal of that of the traditional universities.

It rapidly became obvious, however, that whether academia liked it or not the world had changed and was continuing to change at an increasing rate in terms of the egalitarianism of society, science and technology and the economy. The initial expansion of student numbers in the early post-war years was simply the result of demographic pressure and social change; however, in the mid-1960s a number of measures were adopted, in the face of objections from much of academia, to increase the numbers qualified to study at university level. In part this was done to increase the country's scientific and economic potential and to address the gaps in technology which had developed between West Germany and the USA, but it was also a response to the perception of West German higher

education as failing in international comparison and to public frustration with restricted opportunity in a more democratic age. Nor can the effects of the counter-culture revolution at the end of the 1960s be ignored in this respect. Many of the demonstrations reflected popular dissatisfaction at the elitism inherent in the sytem and the more restricted opportunity, in comparison with some other countries, for those of the working class to access higher education in the FRG.

The opening up of higher education, however, resulted in a huge expansion of the number of students studying the arts and humanities at the expense of more technical subjects. In some respects this was a predictable response in this still highly elitist system, reflecting a desire for social mobility by following the traditional higher education path which prepared students for employment in traditional graduate markets such as the civil service, even some of those who were graduating in technological disciplines. However, it did little to advance the cause of science and technology. Moreover, industry complained of increasing levels of skills obsolescence among those who graduated in the technical and engineering sciences, giving rise to supposition that the teaching provided in these disciplines was outdated and/or inadequate. This, in turn, reflected on the capacity of West German academia to stay abreast of scientific and technological development and its ability to change and adopt the new disciplines required in a modernising economy.

Another significant determinant of the development of the West German higher education system was the highly decentralised federal political structure restored in modified form by the Allied Powers. Under this system the administrative control of education was placed with the individual *Länder* governments. Subsequently, however, political manoeuvring between the *Länder* made any attempt to create a unified national system of education very difficult, particularly when combined with the power exercised by the autonomous and highly bureaucratic self-governing system of the *Hochschulen* and the competing aims of a number of associated professional bodies also involved in the decision-making process. Successive attempts to coordinate a national policy of higher education through the creation of various organs such as the *Deutscher Ausschuß für Erziehungs- und Bildungswesen,* the *Bildungsrat,* the *Wissenschaftsrat* and the *Bund-Länder-Kommission für Bildungsplanung und Forschungsförderung* frequently seemed to complicate matters even further by adding another level of bureaucracy to an already complex, consensual decision-making process.

Change and Reform in East Germany

In the East, change and reform involved a programme of democratisation, sovietisation and planned expansion, most particularly in the engineering and scientific disciplines. Central planning in higher education, however, frequently proved itself inadequate for purpose. Among many other issues, the prioritising of Party loyalty over academic ability among both staff and students led to a general lowering of academic standards. This was exacerbated by the lengthening of the academic year, the pre-eminence accorded to Marxism-Leninism and the 'social sciences' in the curriculum and the continual shortage of teaching materials, ideologically suitable literature and up-to-date equipment. Study in the technical disciplines became progressively more fragmented, narrower and more specialised giving rise to the problem of skills obsolescence by the time of graduation; while restrictions on access to both foreign and domestic research papers restricted the ability of the *Hochschulen* to keep abreast of cutting edge developments in science and technology. The policies of the 1960s led to a further huge increase in engineering science students unmatched by a similar increase in facilities. The effects were manifested in overcrowded, poorly resourced teaching facilities and excessive teaching and administrative burdens. The attempt at the beginning of the 1970s to restrict entry to higher education in line with Honecker's new economic policies and its subsequent reversal led to the resumption of strenuous efforts to increase the number of students studying at higher level and course material being upgraded to incorporate much higher levels of theoretical instruction than previously. The process was, however, bedevilled by poor planning at central level, a lack of flexibility in the system and underfunding which, again, had an impact on the quality of the education provided.

Thus the levels of bureaucracy which accompanied the development of the respective systems, while stemming from very different ideological wellsprings, were instrumental in hampering their efficient operation. As indicated above, investment in higher education was another problem common to both states and became increasingly so in the worsening domestic and international economic climates of the 1970s and 1980s.

Higher Education Financing in West Germany

In the West, the early expansion of higher education was paid for by the strong economic growth of the 1950s and early 1960s; however, the expansion which took place in the late 1960s happened during a period of economic recession and slowing economic growth, that

is, at a time when the *Land* and federal authorities could arguably least afford it. One of the solutions was a much more limited expansion of the teaching body in comparison to the student body, leading to much greater teaching and administrative loads with consequent negative effects on the quality of the teaching and on the time available for research. Post 1970, increasingly rapid expansion took place against the background of two oil crises and a general economic slowdown with consequent detrimental effects on the education budgets of the *Länder*, while the federal contribution to the building of new institutions was also cut back. This, in turn, led to accumulating evidence of declining standards of teaching and research and of growing dissatisfaction among students and teachers alike. The rapidity and extent of the expansion left many students unable to study their preferred subjects leading to a general and increasing tendency to extend academic study over a much longer period of time. Underfunded, overcrowded, poorly resourced teaching and research facilities and an overworked professoriate also worsened the prospects for teaching and research. Attempts to ease the pressure on the *Hochschulen* and promote a more vocational ethos by developing degree programmes in the *Fachhochschulen* and the creation of the integrated 'comprehensive' *Gesamthochschulen* were not as successful as desired. Nevertheless, further reforms which might have eased the situation were delayed and frequently thwarted by the attitudes of the academic senates and the degree of politicking which took place in the decision-making process.

Higher Education Financing in East Germany

Very much the same results were visible in the East German higher education system. Despite the apparently careful planning of student numbers and the much more limited freedom of subject choice, poor decision-making by the planners and the rejection of the economic tools supplied in a free market situation resulted in the development of a progressively more precarious economic situation. The limited attempts to rectify the latter during the 1960s were ultimately rejected by the more hard line faction of the *Politbüro* as being antipathetic to the cause of socialism. Subsequently, a financially ruinous system of social welfare was embarked upon to protect the workers from the realities of the worsening financial situation of the country. The result was, predictably, very much less money being available for the maintenance and expansion of physical capital in the *Hochschulen*. Moreover, the deteriorating salary and working conditions led to increasing levels of defection to industry among the teaching staff. Those who replaced them, if they were replaced, were considerably less experienced. The consequences for teaching and research were inevitably harmful.

Overeducation in West Germany

One potential outcome of the expansion of higher education services identified in the discussion on human capital development was overeducation, or the creation of more graduates than is required in the economy. There are two logical consequences of this, i.e. graduate *un*employment and graduate *under*employment, both arguably representing a waste of resources with respect to the individual's training and for the economy. If, as posited in chapter one, in an elastic labour market employers tend to fill lower-skilled posts with more highly qualified labour, there are two likely by-products. Firstly, qualifications inflation will develop and secondly, the more highly skilled workforce which results from this has the capacity to be more innovative and the potential to create increased productivity and economic growth. In the West, extremely low unemployment figures in all sectors were a consistent feature until the recession following the first oil crisis in 1973. Graduate *un*employment, therefore, did not present a problem during this period and indeed, demand for graduates in the technological disciplines consistently outstripped supply.

*Under*employment, however, became an increasing feature as more traditional sectors for graduate employment began to show signs of saturation because of the much greater numbers acquiring degrees in the humanities and social sciences. After 1973, as opportunities in the graduate sectors declined rapidly, the labour market adjustment mechanism did indeed lead to the development of qualifications inflation and a number of graduates therefore suffered a persistent level of *under*employment. Consistent with the theory, although there was a small increase in graduate unemployment levels, the main burden of unemployment fell mainly on the lower skilled. The numbers of unemployed graduate engineers, chemists, physicists and mathematicians, however, halved[3] because a steady supply of graduates in these disciplines was required to provide the technological expertise required by industries in growth sectors such as chemicals, plastics, automobiles and mechanical engineering. Consequently, the employment situation finally led to a perceptible change in student subject choices away from the humanities and towards the engineering sciences during the 1980s.

[3] Statistisches Bundesamt, *Wirtschaft und Statistik*, issue 1981, p 81

Overeducation in East Germany

Theoretically, unemployment did not exist in East Germany and the demographic development of the country meant that this was unlikely to ever become a problem. The *under*employment of graduates was, however, a chronic problem, particularly after the building of the Berlin Wall, with fewer than one third of graduate engineers finding employment suitable for their qualification level. The ineffective use of graduate labour for reasons of workplace politics was a serious issue in this regard and one which arguably had a serious impact on the innovative potential and productivity levels of industry. Additionally, as previously mentioned, at the beginning of the 1970s the increasing skills levels in the population had led to considerably fewer workers qualifying for lower skilled employment than the Five Year Plan and Honecker's new economic priorities demanded. The ensuing restriction of entry to higher education and rising levels of underemployment in all levels of the economy then became a source of considerable social discontent. Although the policy was later reversed as the economic focus switched to the high-technology sector, workplace culture was such that graduates still struggled to find employment consistent with their level of qualification.

Research and Development in West Germany

If one accepts that scientific and technological progress are necessary for the promotion of economic growth, the interaction between higher education (which directly affects the R&D capabilities of a country and its ability to utilise them effectively) and the level and type of R&D performed assumes great significance. In this respect, the two states could hardly have been more different. In the West, the *Hochschulen* were regarded as the *"Oberzentren"* (principal centres) and the *"Fundament der Forschung"* (foundation of all research) in the FRG,[4] thus guaranteeing a high level of autonomy for its researchers. Nevertheless, by the middle of the 1960s, a number of organisations, including the federal government, were beginning to advocate a more practical approach to scientific and technological research in the *Hochschulen* as well as improved cooperation with extra-academic research institutions and industry on the practical application of research results. By the end of the 1970s, basic research in the *Hochschulen* was absorbing more than one fifth of the whole national R&D budget[5] and economic stringency led to considerably more

[4] Uwe Schimank, *Hochschulforschung im Schatten der Lehre*, (Frankfurt, Campus Verlag, 1995), p 18
[5] 'Bericht der Bund-Länder Kommission für Bildungsplanung und Forschungsförderung der Grundlagenforschung in der Bundesrepublik Deutschland', 29.10.81, Bundestag Drucksache 9/962, p 5

governmental emphasis being laid on improving research planning in the *Hochschulen* to conform to the needs of the economy.

This is not to deny that a good deal of fine scholarship was emerging from West German *Hochschulen*. There were, for example, 22 West German Nobel Prize winners between 1950 and 1989, virtually all of whom won for developments in chemistry, physics and medicine, with the majority of the winners employed in, or working in collaboration with *Hochschulen*.[6] Moreover, basic research, which opens up radically new areas for development, is essential for progress in all fields of science and technology. However, the ethos in the *Hochschulen* was not conducive to the translation of basic research into applied development. Measures were therefore taken to encourage the adoption of different forms of interdisciplinary and cooperative research and improve the levels of technology transfer from the laboratories of the *Hochschulen*, in order to bridge the gap between basic research and its applied development. Parallels between the West and East German systems became very apparent; for example, in the development of competition between *Hochschulen*; the creation of individual institutional profiles for teaching and special research foci (*Schwerpunkte*) designed to foster excellence in defined subject areas; the strengthening of connections to the immediate geographical area of the individual institutions; and the improvement of research planning, all of which had been adopted in the East in the late 1960s.

Technology transfer from the other organs of research in West Germany was much less of a problem, thus allowing technological advance to proceed, albeit along paths dictated by the particular nature of the research structure in the FRG. The best performing sectors of the economy in terms of productivity, economic and export growth were the mechanical and electrical engineering sectors, electrotechnology and the motor vehicle, chemical and machine-building industries. The vast majority of the research involved in developing these industries, however, was applied research frequently undertaken privately within the industries themselves where returns to product improvements, protected by patent, provided strong market incentives to keep expanding research and development initiatives. Nevertheless, such was the pressure for constant technological advance that cooperation with academic institutions was seen as a means of relieving the pressure on the industrial engineers as well as improving access to the basic research underpinning technological development. Moreover, because the *Hochschulen* were the training ground for all

[6] Laureates listed as born and working in West Germany by the Nobel Prize committee on its website http://nobelprize.org/nobel_prizes (accessed 25.8.2009)

researchers, cooperation with academia allowed industries to target the most talented at source.

Research and Development in East Germany

In the East, by contrast, the removal of the vast majority of basic research from the *Hochschulen* to the *Akademie der Wissenschaften,* while detrimental to the *Hochschulen* in many respects, arguably should have allowed them to concentrate more effectively on research with direct applicability to the needs of the economy. Crucially, they were required to develop close financial links with industry in order to perform research in the field of production of local enterprise, undertaking contract research for individual firms. However, the more immediately applicable short-term fixes demanded by industry did not conform to government demands on the *Hochschulen* for the longer-term development of the type of technological progress intended to establish East Germany's global scientific and technological position. This was indicative of the inability of the central planning system to coordinate the conception and execution of policy. Moreover, the inefficiencies of the central planning system, aggravated by a lack of technical knowledge among the planners, led to the wasting of human, physical and financial resources on irrelevant and frequently useless research projects, while its failure to effectively disseminate research results to the relevant bodies for implementation also militated against the system's success. The collectives were in any case opposed to introducing innovation which might temporarily slow productivity and imperil the payment of bonuses on the achievement of monthly and yearly Plan targets.

What small leeway the *Hochschulen* had in terms of selecting research topics outwith the Plans was severely constrained by financial considerations. Moreover, as the economic situation worsened, industry again became increasingly responsible for the funding of research in the *Hochschulen,* thus effectively reducing a considerable proportion of the research efforts of the *Hochschulen* to little more than that of a service function for industry. Although for the first time the research contracts between higher education and industry were legally required to include a component of basic research in order to promote more wide-ranging technological advance, industry was increasingly reluctant to fund this. Moreover, as Bentley points out, the term 'basic research' in East Germany was used to

cover a large amount of applied and product-oriented research.[7] State funding was concentrated on high-technology sectors, which for many reasons including lack of resources, embargos on necessary research equipment and lack of cooperation from the Soviet Union, the GDR was unable to develop adequately. This, then, also meant diverting funding away from lower-technology areas which might have been more effective in creating growth. The reverse or 'copy' engineering programme using smuggled Western technology which resulted ensured that the GDR was unable to keep pace with international standards in the industry.

Performance

The conclusion to be drawn from the above, then, is that while the expansion of the higher education systems of both countries without question increased the skills levels in the population, the beneficial effects of this on economic growth were compromised by the less than optimal conditions in which the mechanism was operating. West German higher education was hampered by inflexible and over-bureaucratic governance in the form of the academic senates, as well as the difficulties, created by its strongly federal political system, of reconciling the differing priorities of the disparate governing authorities, academia, related bodies with input into the educational system and the aspirations of the citizens. This system not only delayed or prevented decisions on structural and curricular changes but was also responsible for hiatuses in funding, leading to the sort of problems outlined in previous chapters. While the human capital of the population undoubtedly expanded significantly, a combination of tradition, culture, counter-cultural revolution and the constitution meant that human capital was raised in areas not necessarily of benefit to the advance of science and technology which were perceived as necessary for economic growth. Nor was competition between academic institutions a feature of the system until later in the 1980s.

However, economic growth proceeded. It is, therefore, tempting to assume that federal government planners may have been thinking too narrowly and were wrong in their assumption that as many engineers and scientists were required to ensure economic growth as thought. A cultured, civilised country does, after all, still require artists, philosophers, linguists and historians, although labour market statistics would suggest that the numbers

[7] Raymond Bentley, *Research and Technology in the Former German Democratic Republic*, (Boulder, Col., Westview Press, 1992), pp 84 – 85

of humanities graduates produced were excessive and that technically trained graduates found employment far more easily. However, it is also possible to posit that the planners were aware of the economic advantages accruing to societies able to generate their own technological innovation outlined at the start of this chapter. They were also well aware that most of the major scientific and technological breakthroughs which precipitated progress and economic growth were emanating from other countries, albeit the FRG proved proficient in absorbing them to create innovation in its own manufactures and services. Moreover, there is another argument to be made that the cost of funding the expansion of higher education would be offset by the economic benefits to be gained from the growth generated by a greater supply of engineers and scientists.

A further reason for West Germany's economic success, however, was arguably due to exposure to extensive domestic and international marketplace competition in the form of the European Economic Community (which later became the European Union). This provided a much more open and rigorous form of competition than much of that which existed within West Germany, where cartelisation and capital concentration remained dominant in many areas of commercial life, restricting the free operation of the domestic marketplace.[8] The intensity of intra-European competition, then, arguably mitigated the worst effects of West Germany's corporate culture and prompted the growth of networks of small- and medium-sized enterprises which were more flexible in their response to market stimuli. Intra-European competition was also at least part of the reason for the constant urging of federal government towards greater technological progress. It is, however, also likely that much of the sort of research on which West German economic growth was dependent did not emanate directly from the institutions of higher education. Many of the larger firms, in response to competitive pressure and what they saw as the intransigence of higher education, were financing their own research and development laboratories. Moreover, they were taking reponsibility for the further training and upgrading of the skills of their workforces in-house, thus increasing the levels of human capital, efficiency and productivity within the firm. This resonates very clearly with the features of the social market economy outlined in chapter one, while the strong emphasis on the coordination of employer/labour interests ensured the development of mutual respect, stable relationships and a low level of workplace conflict, encouraging further

[8] See Jeremy Leaman, *The Political Economy of West Germany 1945 – 85*, (Basingstoke, The Macmillan Press Ltd, 1988), particularly chapters 3 and 5 for a comprehensive discussion of the West German social market economy and the role of the state in its maintenance; also Philip Manow, 'The Uneasy Compromise of Liberalism and Corporatism in Post-War Germany', Working Paper 5.88, Center for German and European Studies, University of California and Berkeley, January 1999, www.ciaonet.org/wps/sites/ucbcges.html (accessed 14.3.2006)

investment in the firm and in training, research and development. On the negative side, it is likely that the strength of the labour laws, a concomitant of the social market economy, were responsible for the reluctance of many firms to hire large numbers of the graduates emanating from the system as well as for their inability to rapidly decrease the size of their workforces during an economic downturn, thus exacerbating their financial situation.

In East Germany, the level of bureaucracy inherent in the socialist system of government and the focus on central planning ultimately created a wholly unwieldy, rigid and inefficient system of government. Some very poor planning decisions, the inflexibility inherent in the system and the refusal to allow the economy to respond to market signals either domestically or internationally, led to a persistently under-performing economy and a vicious circle of underinvestment in industry. Successive attempts to centralise industrial production even more intensively in the form of the *Kombinate*, instead of increasing efficiency, led to even lower levels of competition and hence of innovation, productivity and efficiency on the domestic market. On the international market, rather than encouraging competitive behaviour in the manner of the European Economic Community, East Germany's membership of Comecon ensured it a ready market for whatever it produced, thus eliminating any pressure to innovate, economise and improve. The production of East German goods, therefore, became increasingly expensive while many were unsaleable in developed Western markets, thus cutting off a major source of the foreign currency needed to acquire advanced technology and to service the country's growing debt levels.

The vicious circle extended to higher education where persistent underinvestment had knock-on effects for the economy with regard to the ability to foster innovative activity and advance the level of technology available to industry. This, in turn, meant that less money was available for investment in higher education. Hence, despite a proportionately much larger increase of students in the disciplines necessary for the advance of science and technology than in West Germany, continuing underinvestment and a number of rapid policy reversals, both in higher education and economic focus, created a particularly unfavourable climate for economic growth stemming from an increase in human capital. The socialist guiding principle of central planning proved itself inflexible and inefficient, neither able to promote the development of the scientific research needed for the creation of new technology, nor to enforce its adoption by industry. Higher education's financial reliance on local industry and relative isolation from Western science and technology further hampered the sort of research which might have met the regime's ambitions for the

fulfilment of its economic priorities. Nor was the ideological foundation of the regime hospitable to another advantage of a well-trained workforce, namely the attraction of foreign investment. Moreover, the removal of industry from market influences in the form of profit incentives, price signals and marketplace competition considerably hindered the potential for innovation and the improvement of efficiency and productivity, while workplace politics frequently prevented the effective absorption of the highly qualified graduates into industry and thus their ability to innovate within the workplace and to influence productivity.

It would be wrong, however, to dismiss all East German academics as inferior to those in the West and as career-oriented political appointees, particularly following the Third Higher Education Reform of 1968. There is, however, evidence to support a resurgence, if not a continuation, of the tradition of academic scholarship in the GDR. After the fall of the Berlin Wall, academics from the *Akademie der Wissenschaften* put forward a plan for the restructuring of higher education so comprehensive and detailed that it must have been many months, if not years in the drafting. Amongst other things, it highlighted intellectual freedom and international scientific cooperation in teaching and research as crucial to academic progress and economic growth.[9]

Finally, then, while it might be tempting to downgrade the influence of higher education on economic growth in the context of this study, it should be remembered that the institutions of higher education were responsible for the training of all those who went on to perform the sort of higher-level research which increased the level of science and technology in both countries wherever it was performed and whatever form it took. Moreover, while it is arguable that economic growth in both countries was dependent very much more on the development of applied research and its subsequent incremental development, basic research with its longer-term perspectives and broader contexts provides the foundation of virtually all major scientific and technological advances. Basic research was very much more a feature of the laboratories of West German *Hochschulen* of course, but it also existed to some extent in those of the East, albeit disadvantaged by the circumstances outlined above. Finally, higher education also promoted a general increase in the general level of human capital in the workplace and produced the graduates who went on to occupy positions in areas such as management and the service industries, which were also crucial to the smooth functioning of an economy, especially in the light of the continuing

[9] 'Erneuerung der DDR', November 1989, SAPMO, DY 53/1170

shift from secondary to tertiary economic sector activities. Ultimately, I would argue that the case for human capital development at a higher level as a promoter of economic growth is proven, but that in the case of both Germanys, there were a considerable number of factors preventing the mechanism from functioning as effectively as it could have and which, in the case of the GDR, caused its collapse.

Avenues for Future Research

This study has attempted to perform an analysis of the development of higher education in two countries closely related by tradition but fundamentally opposed politically and ideologically, although both were convinced that increasing the level of human capital development at the higher level was critical for reconstruction, economic growth and an increase in global political influence. With this in mind, a number of issues suggest themselves as fruitful areas for future study. Among these is the question of technology transfer from the institutions of higher education which appeared to present particular problems for West Germany, but also affected the East. The opportunity provided by the archival sources to research and compare a number of case studies would be of particular interest in this respect. A further issue which invites further research is inevitably that of the funding of higher education research in both East and West Germany; the possible distortions to the unity of research and teaching caused through the introduction of funding by agencies outwith the academic sphere and the potential for impeding the effectiveness of human capital development as an economic tool. Finally, the overwhelming conclusion of the vast majority of literature on human capital development is that much more, particularly country-specific, research is needed in order to explore the interactions between different institutional systems and the promotion of higher education in the creation of growth.

Contribution to Historiography

The significance of my thesis to the historiography of higher education lies firstly in its emphasis on the direct comparison of education in the two states at higher level; secondly on its primary emphasis on scientific and technological education and the role of these in furthering economic growth by creating technological advance; and thirdly, in its focus on

the interconnections between the higher education sector, labour markets and economic growth. In so doing, the thesis informs and develops current debate concerning the structure of post-compulsory education, higher education planning and lifelong learning in developed countries generally. More specifically, it contributes to the debate regarding the decline of particularly the East German, but also of other centrally-planned economies as well as that of their short to medium-term economic futures. Moreover, it is positioned within the wider context of the theoretical debate of the contribution of human capital formation to economic growth, addressing by implication the human capital development needs of countries in transition and in the developing world for successful economic growth.

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