

## Executive summary

Key findings of the report:

1. Britain is developing an 'hourglass economy' where high skilled jobs requiring formal qualifications are increasing and those in the middle are squeezed.

- The number of middle income jobs fell by 13 per cent from 1995 to 2010. Meanwhile the number of high and low income jobs both went up (by a third and a tenth respectively).
- Since 1995 managerial, professional and highly technical roles that require formal academic qualifications have risen by a third.
- Skilled trades and secretarial roles have fallen by a tenth, with machine operatives dropping a quarter.
- Personal services jobs have risen but are low paid, while unskilled work remains steady.

2. Britain's international competitors have all seen a strengthening and widening of academic education to address the need for an educated society.

- In Germany, schools increasingly offer a more rigorous curriculum and top apprenticeships often require A-level standard education.
- In Japan, subjects are being developed to involve more intellectual agility.
- In the US, top graduates are being recruited to address poor teaching standards.
- France has struggled to reform but has identified similar problems, including the need to increase the core academic content at schools.

3. England's low income students have been let down by poor teaching and an 'equivalence' system that mis-sells the value of low quality GCSE and A-levels.

- England has one of the largest qualification gaps between teachers of high and low income students.
- Low income students have been mis-sold new GCSEs and A-levels such as Law on the basis that they are 'equal' according to league tables and UCAS points. However the evidence is that universities and employers value core academic subjects; mathematics, English, history, geography, languages and sciences more highly. The result is poor performance with only 4 per cent of Free School Meal students achieving 5 A\*-C in the core academic subjects compared to a 15 per cent national average.
- Britain has the lowest proportion of 16-18 year olds studying mathematics compared to competitor countries, creating a vicious circle of poor mathematics teaching.
- Only a fifth attend university from the lowest income quintile compared to over half from the top quintile. The rate of low income attendance at top universities has stagnated at 2 per cent.

4. England needs to reform the rigged qualification system so that rather than being encouraged to move away from core academic subjects, low income students are encouraged to study them so that they have access to the emerging top jobs.

- Publish teacher qualifications on school websites and reform 2003 terms and conditions to abolish national pay bargaining and free teacher time.
- Encourage the take up of the rigorous E-BACC GCSEs (English, mathematics, sciences, humanities and languages) by reporting partial success at E-BACC on a points basis.

# Academic rigour and social mobility: how low income students are being kept out of top jobs

Elizabeth Truss

March 2011

CENTRE:FORUM

- Create an A-BACC: a minimum of three rigorous A-levels with at least an AS in mathematics and an AS in a humanity. This would represent a Gold Standard to indicate students were 'Russell Group Ready'.
- Create 'vertical AS-levels' studied over two years in mathematics, science and humanities to improve take up of key subjects and remove one year ASs.
- Abolish the university points system to end the culture of equivalence and publicise subject entry requirements for university courses and the qualifications of those accepted.

To summarise, low income students are being steered away from the most rigorous academic subjects, putting them out of contention for top jobs. The middle of the job market is being squeezed and in order to secure the growing number of professional, managerial and technical jobs, applicants require respected formal qualifications. Low income students who don't receive the 'morse code' emanating from employers and top universities have been 'mis-sold' low quality GCSE and A-levels and find themselves on the outside track.

## Section 1: The reality of the jobs market

**Britain’s poor record of social mobility will only improve if the current generation of young people from low income families have a fighting chance of getting one of the new jobs available in the market. The evidence suggests increased polarisation between high skilled and unskilled jobs, with skilled trades and clerical roles diminishing. Long standing industries are becoming automated, while newly emerging industries demand high skills. Formal and general qualifications are the main route into these jobs. At the top level MBAs and international experience is the new benchmark. Despite popular perception, the middle is gradually disappearing to create an ‘hourglass economy’.**

### The squeezed middle

Technology and automation is squeezing the middle from the jobs market, which has been dubbed by some as an ‘hourglass economy’.<sup>1</sup> There is a polarisation of jobs between the high and low skilled, while the wages and numbers of those in the middle are falling.<sup>2</sup> (See Figure 1.)

### Sharp increase in professional, technical and personal service occupations

The impact in the UK has been a dramatic increase in the number of high and low skilled jobs while the middle has declined.

Although as a group the fastest growth has been in personal service occupations, all other areas of growth have been those requiring a high level of education and formal qualifications.

### Managers and senior officials – up 24%

Between 1995 and 2010 850,000 extra people were employed in these jobs.<sup>3</sup> Typical roles include senior civil servants, company directors, small business owners and senior managers in HR and finance.<sup>4</sup> Jobs in this sector attract an average annual salary of just under £36,000<sup>5</sup> and often require degree level education and significant professional experience.<sup>6</sup> At the very top level it is becoming increasingly common for roles to be filled by MBA holders.<sup>7</sup>

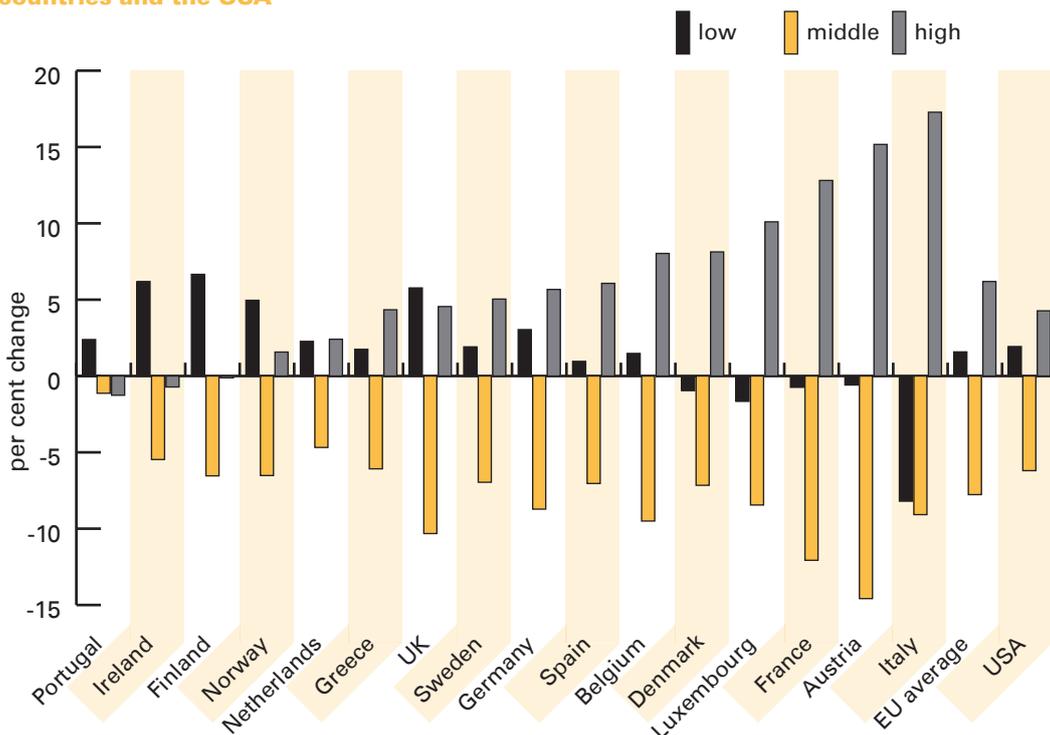
### Professional occupations – up 36%

Between 1995 and 2010 over 1 million extra people were employed in these jobs.<sup>8</sup> Typical roles in this category include teachers, lawyers, architects, doctors and university lecturers.<sup>9</sup> Jobs in this sector attract an average annual salary of £34,500<sup>10</sup> and require degree level education often accompanied by professional training and/or significant professional experience.<sup>11</sup>

### Associate professional and technical occupations – up 35%

Between 1995 and 2010 1.1 million extra people were employed in these jobs.<sup>12</sup> Typical roles in this category include laboratory technicians, nurses, and IT professionals such as systems administrators and network technicians.<sup>13</sup> Jobs in this sector attract an average annual salary of just under

**Figure 1: Change in employment shares by wage tercile, 1993 – 2006 in 16 European countries and the USA**



Source: Autor (2010) *The Polarization of Job Opportunities in the U.S. Labor Market: Implications for Employment and Earnings*, The Center for American Progress and the Hamilton Project

£27,000;<sup>14</sup> most employees are educated to at least A-level or equivalent standard, though an increasingly large number have degrees.<sup>15</sup>

**Personal service occupations – up 48%**

Between 1995 and 2010 over 800,000 extra people were employed in these jobs.<sup>16</sup> Typical roles in this category include hairdressers, nannies, care assistants and hospital administrators.<sup>17</sup> Jobs in this sector attract an average annual salary of just under £13,000<sup>18</sup> below the national average and much less than the other growth areas. Unlike other growth areas most employees are only educated to a general level (equivalent to GCSE) and some will have gone through specific occupational training.<sup>19</sup> (See Figure 2.)

**Trades and administrative occupations have seen a decline**

Meanwhile the number of medium skilled jobs has fallen as they have been gradually automated over time by ever improving technological advances.<sup>20</sup> For example in farming, computers are now used to direct combine harvesting while business negotiation is required to position products with major supermarkets. This has been repeated in areas such as manufacturing; car production is highly automated requiring fewer but higher skilled employees.<sup>21</sup> The decline in secretarial and administrative jobs has been faster in the private sector, with the public sector being slower to reform and take

advantage of new technologies.<sup>22</sup> These are typically jobs that would have required a basic level of education. Most only require GCSE or equivalent qualifications though a few need A-level or a vocational equivalent.

**Administrative and secretarial occupations – down 9%**

Between 1995 and 2010 over 300,000 fewer people were employed in these jobs.<sup>23</sup> Typical roles in this category include secretaries, receptionists, and typists.<sup>24</sup> Jobs in this sector attract an average annual salary of just over £16,500;<sup>25</sup> most employees are educated to a general level with some having had additional vocational training.<sup>26</sup>

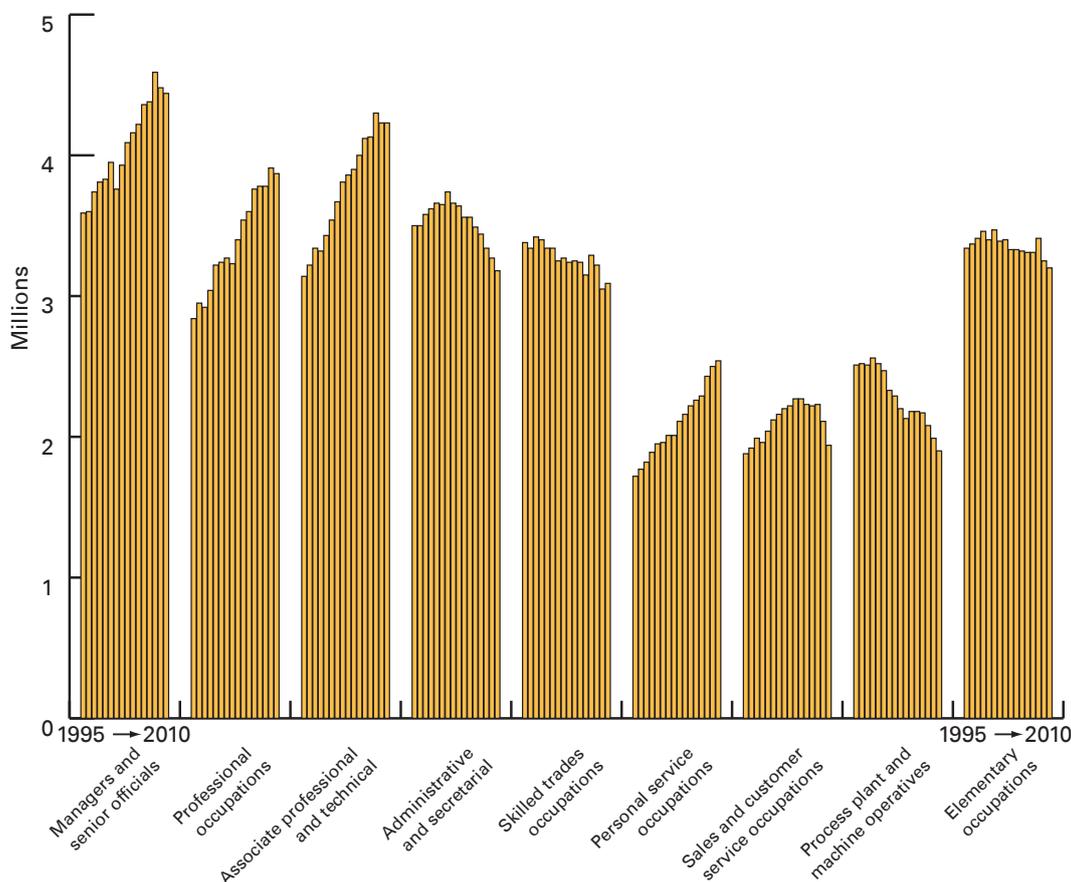
**Skilled trades occupations – down 9%**

Between 1995 and 2010 just under 300,000 fewer people were employed in these jobs.<sup>27</sup> Typical roles in this category include welders, carpenters and plumbers.<sup>28</sup> Jobs in this sector attract an average annual salary of just under £23,000 (above the national average);<sup>29</sup> most employees are educated to a general level accompanied by professional qualifications and registration with professional bodies.<sup>30</sup>

**Process, plant and machine operatives – down 25%**

Between 1995 and 2010 over 600,000 fewer people were employed in these jobs.<sup>31</sup> Typical roles in this category include factory workers, miners, taxi drivers and HGV drivers.<sup>32</sup> Jobs in

**Figure 2: Employment by occupational type<sup>3</sup>, UK, 1995 to 2010**



\* Occupational codings were changed in 2000 but remain comparable.

this sector attract an average annual salary of £21,000 (the national average);<sup>33</sup> most employees are not required to have reached a particular standard of education but will often have some on-the-job training.<sup>34</sup>

#### Sales, customer service and elementary occupations remain stable

While there has been a sharp increase in high-skilled and some low-skilled jobs, the vast majority of those careers requiring a general level of formal education or below have remained stable. Job opportunities remain for those with few academic qualifications but the difference in average pay between these and high-skilled jobs is substantial. For example, the average salary in sales and customer service occupations is just under £10,000 while for professional occupations it is £34,500.

#### Sales and customer service occupations – up 3%

Between 1995 and 2010 60,000 more people were employed in these jobs. However, although the long term trend is a modest increase, the short term trend has been strictly negative.<sup>35</sup> Typical roles in this category include shop assistants, call centre workers, milkmen and market traders.<sup>36</sup> Jobs in this sector attract an average salary of just under £10,000 (below the national average);<sup>37</sup> whilst some employees may require a degree of specific knowledge regarding the product or service being sold, most employees are

educated to a general level and have skills in interpersonal communication.<sup>38</sup>

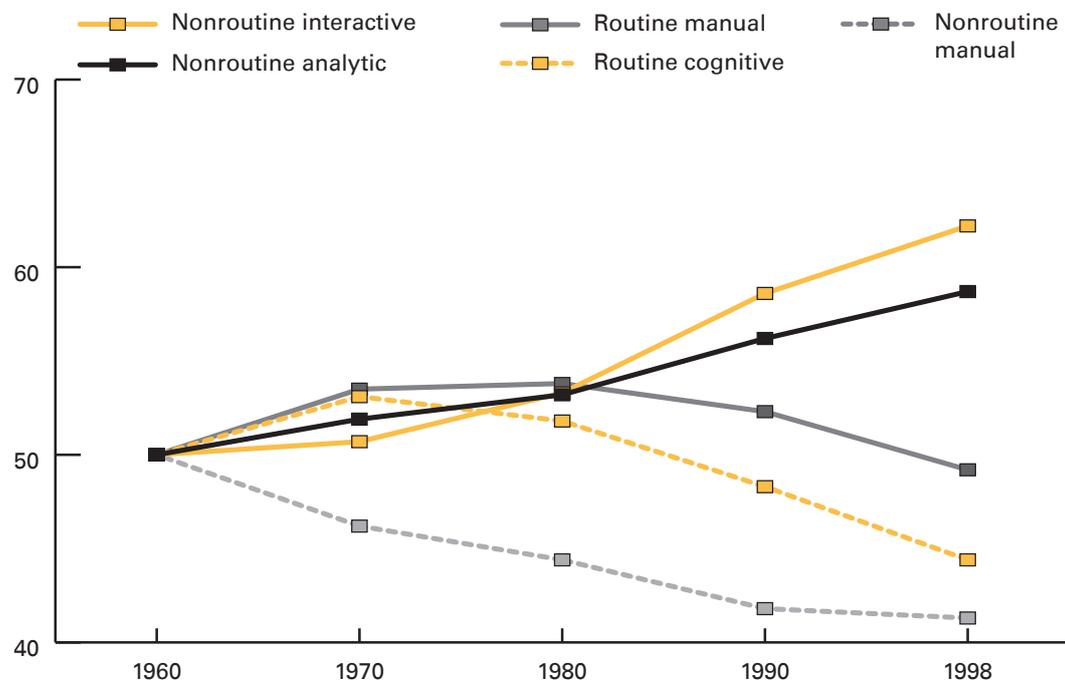
#### Elementary occupations – down 4%

Between 1995 and 2010 140,000 fewer people were employed in these jobs, but the general trend is relatively stable.<sup>39</sup> Typical roles in this category include handymen, fruit pickers and office cleaners.<sup>40</sup> Jobs in this sector attract an average salary of just over £11,500 (below the national average);<sup>41</sup> most occupations in this group do not require formal education qualifications but employees may undertake a short period of formal experience-related training.<sup>42</sup>

#### The importance of general education

Cognitive ability<sup>43</sup> is becoming increasingly important as automation reduces routine work. The evidence suggests the need for cognitive ability increases with job complexity, the need for non-cognitive interpersonal skills does not unless the role requires leadership or managing staff.<sup>44</sup> Whilst a large proportion of cognitive ability is developed prior to adolescence, subjects such as mathematics, sciences, languages and history develop the faculty to think and reason.<sup>45</sup> This is recognised by businesses who rely upon GCSEs and A-levels, Degrees and Masters Degrees as a measure of these abilities.<sup>46</sup> In other words they favour a general education as outlined in the Wolf Report rather than specific vocational qualifications.<sup>47</sup> However, the

Figure 3: Growth of non-routine cognitive skills\*



Source: Autor et al. (2003) 'The Skill Content of Recent Technological Change: An Empirical Exploration', *Quarterly Journal of Economics*, 118(4)

\* Non-routine analytic/interactive (= cognitive): Examples include medical and legal professions, managerial roles, sales and advertising. Increased use of automation and ICT complements these roles. Routine cognitive: Examples include record-keeping roles or repetitive customer service positions (e.g. bank teller). Automation and ICT can act as substitute for people doing roles. Non-routine manual: Examples include HGV driver, cleaner etc. Limited scope for ICT and automation to act as a substitute or complement these roles. Routine manual: Examples include assembly line work, picking and sorting agricultural products. Substantial scope for ICT and automation to replace these roles.

economic return to the individual depends on the subject studied with numerate disciplines having a much higher rate of return.<sup>48</sup> At all levels the current education system fails to produce enough people with the quantitative skills that the market demands.<sup>49</sup> The current debate about the number of students going to university is the wrong one.<sup>50</sup> The question should be about the quality of the courses and the return on study for students. Research has shown that the formal study of more advanced academic subjects at secondary school as well as university has a substantive impact on future earnings.<sup>51</sup> In the UK it is courses that allow access to university, such as A-levels<sup>52</sup> and BTECs<sup>53</sup> that generate the highest returns; whereas low level vocational courses, such as an NVQ Level 2, generate only a small or negative return.<sup>54</sup> (See Figure 3.)

### At odds with perception

The perception of the jobs market can be at odds with the reality and varies according to background. 19 per cent of low income parents want their child to learn a trade compared to just seven per cent of high income parents.<sup>55</sup> However, of the Millennium Cohort parents virtually all wanted their children to go on to Higher Education, irrespective of income.<sup>56</sup> In the political debate academic and technical or vocational education are often positioned as opposites.<sup>57</sup> The reality of today's job market suggests that academic and technical qualifications are complements.<sup>58</sup>

## Section 2: Other countries are extending general education

**Changes in technology have meant that education systems designed for a mass unskilled workforce and small elite of management are no longer viable. Virtually all of the leading developed countries insist on a core of academic subjects until 16 and many require English (or equivalent) and mathematics until 18. They are also moving towards a further bolstering of key general education and academic capabilities. Rather than specialisation at an early age students follow a common academic track; or in those countries where tracks exist movement between the various educational tracks has been eased. There is a recognition that teaching has to be a high status profession in order to bring in sufficient quality both in high and elementary schools. They recognise that only if students are properly educated by high quality teachers from the start will they have the opportunity to take the most rigorous academic subjects later on. There are many good examples of reform in smaller and developing countries; however efforts to change the system in Britain's major developed competitors provide a more realistic comparison.**

### Germany has increased the content of education for all in response to demand

Following poor results in the Programme for International Student Assessment (PISA) in 2000 and concerns that Germany was producing the wrong kind of skills, German states boosted the content and rigour of core academic subjects.<sup>59</sup> Germany has traditionally had a tri-partite level system of secondary education where all students study a general education at varying levels before going on to apprenticeships or university.<sup>60</sup> However, some states such as Berlin and Hamburg have increased the general quality of education by merging Hauptschulen, which offers a basic education, and Realschulen, the middle level school.<sup>61</sup> In Berlin all students are now able to be awarded the Abitur (the equivalent of A-levels) so long as they achieve the required academic standard.<sup>62</sup> These changes to the education system have only taken place in the last couple of years and have been driven by the demand of employers for better qualified workers and educational inequality in many major cities.<sup>63</sup>

Those employers offering apprenticeships will in many cases seek the Abitur or the Mittlere Reife, the mid-level qualification, while the Hauptschulabschluss, the least-prestigious secondary level qualification, is no longer acceptable for the most desirable apprenticeships.<sup>64</sup> In Britain policy makers are often unaware of the declining prestige of the Hauptschulabschluss, thinking it remains well respected by employers.<sup>65</sup> Students with the Abitur, despite being able to go on to university, make up over 14 per cent of all those taking apprenticeships and are normally found in those apprenticeships requiring a high-level of non-routine cognitive skills such as banking, insurance, IT, industrial management, and hotel management.<sup>66</sup> In PISA 2009 Germany moved into the group of countries that significantly outperform the UK at mathematics.<sup>67</sup>

### Top graduates introduced to raise standards in the US

The US has realised top graduates need to go into teaching if schools standards are to rise. Studies in Dallas, Tennessee and Boston all showed that students with high quality teachers showed substantial improvements in academic performance – especially amongst low achieving students.<sup>68</sup> The push to get highly qualified teachers into US classrooms was a key element of No Child Left Behind (2002). This has since been supplemented by the American Competitiveness Initiative (2006), which aims to train 100,000 highly qualified Maths and Science teachers by 2015,<sup>69</sup> and most recently the Race to the Top Initiative (2009).<sup>70</sup> This has been replicated on a local level with fast improving school systems, including Boston, New York and Chicago, setting up their own programmes to attract high quality graduates and professionals.<sup>71</sup>

### France struggles to reform its education system

France is currently struggling with a split between excellent elite education and poorer quality mass HE establishments.<sup>72</sup> The President and his ministers are also in a battle with teachers over terms and conditions, which are heavily centrally directed, and the Government's attempt to reduce teacher numbers.<sup>73</sup> In an effort to counter what former education minister Xavier Darcos has called "the continued degradation of the performance levels in our education system", there has been added emphasis on French and mathematics as academic subjects, as well as reducing the foreign-language gap.<sup>74</sup> Poor results in the 2003 PISA results justified, according to Darcos, "putting back some school into the schools."<sup>75</sup>

### Japan places greater emphasis on ability to think

In the 1990s Japan's system of secondary education was criticised by business organisations as failing to provide the creative and reasoning skills needed to compete in the modern world.<sup>76</sup> This was recognised by the Ministry of Education's 1998 Educational Reform Programme, which stated that "the ability to learn and think for oneself has been neglected."<sup>77</sup> In an attempt to solve these deficiencies, the Ministry of Education introduced Integrated Learning as a subject in the 1999 curriculum reform in order to improve the ability of students to solve problems independently and think creatively.<sup>78</sup> Such reforms are in stark contrast to an educational and social culture that is often perceived as rigid and highly conformist.<sup>79</sup>

### Britain is an outlier

In its recent paper on mathematics at post 16 the Nuffield Foundation suggested that Britain is an outlier amongst competitor countries, having the lowest post 16

participation rate.<sup>80</sup> England, Scotland, Wales and Northern Ireland are four of only six countries surveyed which do not require compulsory participation in mathematics at post 16 for any students.<sup>81</sup> Mathematics is the subject Britain is relatively worse at, coming 28<sup>th</sup> in the PISA 2009 league tables.<sup>82</sup> The Wolf Report found that Britain was "effectively unique" in lacking a requirement for all students in post 16 education to continue studying mathematics and their own language.<sup>83</sup>

The requirement to study only English and mathematics until 16 is in contrast to the approach taken elsewhere of students taking English (or equivalent), mathematics, science, and at least one foreign language and one humanity/social science. Countries adopting this approach include Canada, Finland, France, Greece, Italy, Japan, Netherlands, Norway, and South Korea.<sup>84</sup> In almost every other developed country specialisation does not take place until post 16; instead a core academic subject is studied.<sup>85</sup> (See Table 1).

### Top performing countries have top teachers

Top performing countries have identified high quality teachers as the key to improving educational quality.<sup>86</sup> Finland recruits its teachers from the top 10 per cent of graduates<sup>87</sup> and requires all teachers to have a Masters degree.<sup>88</sup> Teaching is considered on a par with law and medicine in terms of prestige, with over 6,600 applicants for 660 places to train as a primary school teacher.<sup>89</sup> This highly selective system of recruitment is repeated in other top performing countries. In South Korea primary school teachers come from the top five per cent of graduates, while Singapore and Hong Kong recruits teachers from the top 30 per cent.<sup>90</sup> This experience has been reproduced on a smaller scale in the UK. The introduction of top graduates, via the Teach First Programme, to schools in deprived areas has been shown to boost students' performance.<sup>91</sup>

**Table 1: Compulsory examinations at 16 in key OECD countries**

|         |                                    |  |
|---------|------------------------------------|--|
| England | Mathematics<br>English             |  |
| France  | Mathematics<br>French<br>Science   | History<br>Foreign Language<br>Geography |
| Germany | Mathematics<br>German              | Science<br>Foreign Language              |
| Japan   | Mathematics<br>Japanese<br>Science | Social Studies<br>Foreign Language       |
| USA     | Mathematics<br>English             | Science<br>History                       |

Source: International Review of Curriculum and Assessment Frameworks; Eurydice

### Section 3: Mis-selling to low income students

**England's low income students are let down by poor teaching and an 'equivalence' system that mis-sells the value of lower quality GCSEs and A-levels. Despite the evidence that core academic subjects (English, mathematics, history, geography, languages and science) are the most valuable, league tables and the UCAS points system do not reflect this. Without prior knowledge of the employment market or university preferences, poorer students inadvertently end up cutting off options for further study or work. This is having a negative effect on Britain's overall educational performance. In its failure to provide clear routes for students from low income backgrounds, Britain lags behind its international competitors.**

#### Short-changed on teaching resource

The evidence, where it exists, suggests that those from low income backgrounds suffer from poorer quality teaching in core academic subjects. This means when they get to 14 and make GCSE choices, they may have already been short-changed by the system. A report produced in Missouri in 2007 shows that England is particularly poor in the allocation of teaching resource between rich and poor children, especially for core subjects such as mathematics.<sup>92</sup> England comes fourth out of 46, worse than the US and much worse than Scotland, for the gap between rich and poor students being taught mathematics by teachers with a degree in the subject.<sup>93</sup> In the UK the student/teacher ratio is worse for pupils from deprived backgrounds than their more affluent counterparts.<sup>94</sup> Out of OECD member states only Turkey, Israel, Slovenia and the USA have a wider gap than the UK.<sup>95</sup>

Poor teaching is reflected in pupil outcomes. Less than half of students from the poorest decile achieved an A\*-C grade in GCSE mathematics compared to over 80 per cent of the most affluent decile.<sup>96</sup> Not enough of the money has been spent on improving teaching quality, which is the most important factor in educational attainment.<sup>97</sup> Instead the doubling of spending between 1997 and 2008<sup>98</sup> has gone on ring fenced budgets or has been used to pay for the administrative burden resulting from restrictive terms and conditions, especially those introduced in 2003.<sup>99</sup> Accountability problems and excessive bureaucracy, has meant that head teachers have had to spend time jumping through hoops, and are not left with enough time to manage the school and teachers effectively.<sup>100</sup> Gaps in performance are exacerbated by lower quality teachers being allocated to those who have fallen behind, with teaching assistants increasingly used in secondary schools as an inexpensive option in the teaching of lower-sets.<sup>101</sup>

#### Steered away from academic subjects at GCSE

Students are led to believe that "a GCSE is a GCSE": in fact some are more equal than others in terms of the opportunities that are opened up at A-level and university.<sup>102</sup> Subjects including mathematics, English, history, geography, languages and sciences lead on to A-levels which gain access to the top universities. However, league tables value all subjects equally (except English and mathematics) and therefore rig GCSE choices against subjects which are considered more difficult.<sup>103</sup> This disproportionately affects those from low income backgrounds who end up taking 'easier' subjects at GCSE. Whereas 15 per cent of students passed the Government's new E-BACC of five core academic GCSEs at A\*-C<sup>104</sup>, only four per cent of those on Free School Meals did.<sup>105</sup> The removal of the language requirement at KS4 in 2004<sup>106</sup> has meant that the drop off in foreign languages has been the most pronounced; while 79 per cent of students studied at least one foreign language in 2000 by 2008 and 2009 the proportion has dropped to 44 per cent.<sup>107</sup> Only 10 per cent of comprehensive school pupils sit triple science GCSE (with physics, chemistry and biology each constituting a whole GCSE), while 57 per cent do so in grammar schools and 33 per cent sit the three sciences at private schools (both of which are more likely to have students from more affluent backgrounds).<sup>108</sup> The failure to study core academic subjects at GCSE has a knock-on effect at A-level (or top apprenticeships) in determining grades and breadth of choice.

#### Misinformation about A-levels

Many low income students are restricting their future chances by the subjects they choose at A-level. League table 'equivalence' and UCAS points mean that students and schools can achieve better results by studying easier subjects away from the academic core.<sup>109</sup> In 2000, the introduction of a large number of new A-levels coupled with modularisation resulted in a migration away from core academic subjects, particularly mathematics.<sup>110</sup> Though the number of students taking mathematics at A-level has risen sharply in recent years<sup>111</sup> Britain has lower levels of participation in post 16 mathematics than any other competitor country.<sup>112</sup>

This disproportionately affects those from poorer families at lower ranking schools, who do not receive the 'morsecode' emanating from universities. For example a law A-level might be assumed to help prepare one for a career as a lawyer. In fact the LSE lists it as a non-preferred subject<sup>113</sup> while the Russell Group's guide to post 16 education only recommends English and history for prospective law students.<sup>114</sup> Students at private schools are one-and-a-half times more likely to study mathematics A-level and two-and-a-half times more likely to take further mathematics than state school students.<sup>115</sup> Meanwhile, only seven per cent of comprehensive school students take at least one science A-level compared with

33 per cent of grammar school students and 28 per cent of private school students.<sup>116</sup>

Fearing claims of being 'elitist' or not encouraging wider access, universities have failed to make clear which A-levels they favour. This is starting to change with the LSE listing non-preferred A-levels on its website,<sup>117</sup> and the Russell Group publishing a guide for those going on to post-16 education.<sup>118</sup>

#### **Losing out in university entrance**

The choices taken and tuition received earlier in their school career mean that low income students are less likely to go to university and less likely to study high value courses at high value universities. The tuition fees debate was predicated on the idea that low income students would be put off universities by fees. In fact compared to other countries England already has a very poor rate of university attendance by students from deprived backgrounds (19 per cent).<sup>119</sup> This compares to approximately 30 per cent in Australia<sup>120</sup> and over 50 per cent in the US.<sup>121</sup> Participation rates from the bottom quintile at England's most selective universities have hovered around the two per cent mark since 1995.<sup>122</sup> The primary cause is that too many lower income students have not studied the right qualifications.<sup>123</sup> Students are not being taught the academic basics and then end up cutting off options of study further on. The percentage of students studying for degrees in science, technology, engineering and mathematics (STEM) as well as modern foreign languages has declined significantly over the past decade, despite the fact that these subjects generate the best job prospects and returns to education.<sup>124</sup> Estimates suggest that by 2014 there will be unmet demand for 775,000 roles requiring higher level science, technology, engineering and mathematics. Also around 60 per cent of businesses expect problems recruiting staff with STEM skills over the next three years.<sup>125</sup>

#### **The lowest performing 20 per cent**

There are students who struggle with academic subjects. These are the 20 per cent referred to by Dearing as failing to achieve even a basic level in English and mathematics.<sup>126</sup> However the lowest ability students are capable of studying general subjects at some level. In Germany students at the Hauptschulen (approximately the bottom quintile<sup>127</sup>) still receive a general education but at a lower level.<sup>128</sup> The question of motivating students, setting students and teaching in a way that engages the students should be the responsibility of the school. One of the options may be that subjects are studied in a more practical way. This is not a licence to neglect the academic core as past governments have done; a fact reflected in the 40 per cent of Britons who possess only basic skills compared to 28 per cent in France, 22 per cent in Germany and 34 per cent in the United States.<sup>129</sup> Governments have been too quick to place these students

on courses like the Foundation Learning programmes from which progression is effectively impossible;<sup>130</sup> thereby, greatly impairing their future prospects. The Wolf Report correctly points out the necessity of ensuring students who fail to achieve GCSE A\*-C English and mathematics continue to study these subjects to ensure future GCSE entry and success.<sup>131</sup>

#### **Either/or choice at 14 is not the solution**

For the broad majority of students, between 80 and 90 per cent,<sup>132</sup> an either/or choice at 14 is not the solution. The Tomlinson report was right in its analysis that the general core had to be strengthened.<sup>133</sup> But instead of teaching reform there was the creation of new untested qualifications which then did not have sufficient academic rigour.<sup>134</sup> Critics of the new University Technical Colleges (UTCs) suggest that may happen with this proposal, unless there is a sufficient guard against it.<sup>135</sup> There have been suggestions that the academic core should be abandoned at 14 by former Education Secretary Estelle Morris<sup>136</sup> and the Sutton Trust.<sup>137</sup> This approach has been categorically rejected by the Wolf Report,<sup>138</sup> but such suggestions have prompted fears that students from affluent backgrounds increasingly pursue academic paths while their disadvantaged counterparts end up taking vocational courses.<sup>139</sup>

#### **Poor achievement by low income students is Britain's failure**

The poor educational outcome of low income students is a phenomenon in the UK which has one of the largest gaps between elite and basic education. A student's socio-economic background impacts on their performance as measured by PISA 2009. 14 per cent of the variation in student performance is accounted for by students' socio-economic background compared to nine per cent in Canada and Japan.<sup>140</sup> If the wider family background is looked at the figure in the UK is higher than 25 per cent whereas in Canada, Japan, Finland or Korea it is below 19 per cent.<sup>141</sup> The figure between schools is even more striking. 77 per cent of the difference in student performance between schools in the UK can be accounted for by socio-economic background; Luxembourg is the only OECD country where the figure is higher.<sup>142</sup> Improving the performance of students from disadvantaged backgrounds would have a significant impact on the UK's international ranking.

## Section 4: Recommendations

**England needs to reform the rigged qualification system so that rather than being encouraged to move away from core academic subjects, low income students are encouraged to study them so that they have access to the emerging top jobs. Compulsory education and training until 18 presents an opportunity to make this happen. As the Wolf report advocates, calls for 14 year olds to leave the general education path should be rejected.<sup>143</sup> It is imperative that the education system does not prepare students for jobs that do not and will not exist. Students should be shown a clear path to the top jobs through their primary and secondary education. This clear signalling would extend to an E-BACC and an A-level equivalent (the A-BACC), which would align Britain with the expectations that other countries have of their students, rather than the low aspirations at present.**

### Upgrade teaching for the poorest students

Head teachers should use pupil premium money to recruit high quality teachers rather than spend it on the periphery. Government should reform 2003 Terms and Conditions to free up teacher time and allow all schools to depart from pay scale requirements to recruit top quality academic knowledge (e.g. address the growing shortage of mathematics teachers). Schools should publish teachers' qualifications as proposed in Finland to give more transparency to parents.<sup>144</sup> The government should implement the recommendation of the Williams report that every primary school should have at least one teacher who is a mathematics specialist.

### Strengthen the English Baccalaureate

Low income students should be in no doubt that the E-BACC is the route to the best universities and jobs. It should equate to what students in the USA call 'college track' combinations, i.e. those that will allow them to progress on to higher education.<sup>145</sup> The E-BACC being published with overall GCSE results has already been successful in putting pressure on schools to strengthen the academic core. The government should further strengthen accountability by recording partial success towards the E-BACC and recording the number of points acquired. The E-BACC should be the central plank in both academic and vocational education to ensure transferability as confirmed by the government and recommended in the Wolf Report.<sup>146</sup> In due course the E-BACC could develop as a single qualification and be examined like SATs, reducing the cost to schools of examinations.

### Extend Baccalaureate to A-Level

Students from low income backgrounds should be given a clear indication of which subjects are most respected and ensure entry to the top

universities. An A-BACC should be introduced that is a grouping of top A-levels. By appearing in league tables this would encourage schools to produce 'Russell Group Ready' students rather than trying to maximise A grades in subjects that are manifestly unequal. This would provide much better empirical evidence about how many pupils emerging from state schools are academically prepared to go to the top universities and shine a light on school practice at A-level.

The A-BACC would be a selection of three of the core academic subjects of mathematics, the sciences, English, foreign languages, history and geography. A minimum of AS mathematics and an AS in history, English or a modern language should be included in the measure. For those studying three-and-a-half to four A-levels a further AS or A-level could be taken.

As part of the A-BACC, rigorous two year 'vertical ASs' should be introduced, initially in mathematics, languages and the humanities. By reforming the AS to be studied over two years and examined at the conclusion (as is proposed for the A-level) this would reduce the breadth and strengthen the depth, ensuring that an AS was as hard but less time consuming than the A-Level.

For example, in mathematics students doing a horizontal one year AS would do the first elements of the course (let us say Pure Mathematics 1 and Applied Mathematics 1). Meanwhile, on a vertical two Year AS, a student would study the first and second year of an element of the course (for example Pure Mathematics 1 and Pure Mathematics 2). These would be of the same standard and include half the course content at A-level and could be taught with A-level groups so as not to dilute teaching resources.

The A-BACC would provide increased transparency to students about what universities consider to be high value subjects. It would also provide greater breadth by asking those specialising in science to 'elect' a humanity and those studying arts to 'elect' a science, whilst preserving the advantage of the depth of the English system. In setting offers, universities would need to bear in mind the difficulty of studying a broader range of subjects; achieving an A-BACC should carry a higher weight in the market than less rigorous A-levels.

### Create transparency on university access

Universities must play their part by sending clear signals. All A-level offers should be on the basis of specific subjects to reduce the culture of equivalence. UCAS should become a clearing house for HE applications instead of a collator of points to allow communication between applicant and university. Universities should be encouraged to specify mathematics to at least AS-level to improve the 'reproductive cycle' of mathematics into schools. Finally, universities should publish the A-level subjects and grades of all applicants and students entering their institutions.

## Notes

- 1 Anderson (2009) 'Intermediate occupations and the conceptual and empirical limitations of the hourglass economy thesis', *Work, Employment and Society* 23 (1): 169-180
- 2 Autor (2010) *The Polarization of Job Opportunities in the U.S. Labor Market: Implications for Employment and Earnings*, The Center for American Progress and the Hamilton Project
- 3 Office for National Statistics, Labour Force Survey
- 4 Office for National Statistics (2000) Standard Occupational Classification 2000
- 5 Office for National Statistics (2010) Annual Survey of Hours and Earnings 2010
- 6 Office for National Statistics (2000) Standard Occupational Classification 2000
- 7 Ibara et al. (2010, 1 March) Want to be a chief executive? Get an MBA, *The Financial Times*. Retrieved 21 January 2010 from <http://www.ft.com/cms/s/0/2eaaee4c-24d2-11df-8be0-00144feab49a.html#axzz1BfI3Yxd5>
- 8 Office for National Statistics, Labour Force Survey
- 9 Office for National Statistics (2000) Standard Occupational Classification 2000
- 10 Office for National Statistics (2010) Annual Survey of Hours and Earnings 2010
- 11 Office for National Statistics (2000) Standard Occupational Classification 2000
- 12 Office for National Statistics, Labour Force Survey
- 13 Office for National Statistics (2000) Standard Occupational Classification 2000
- 14 Office for National Statistics (2010) Annual Survey of Hours and Earnings 2010
- 15 Office for National Statistics (2000) Standard Occupational Classification 2000
- 16 Office for National Statistics, Labour Force Survey
- 17 Office for National Statistics (2000) Standard Occupational Classification 2000
- 18 Office for National Statistics (2010) Annual Survey of Hours and Earnings 2010
- 19 Office for National Statistics (2000) Standard Occupational Classification 2000
- 20 Goos et al. (2007) Lousy and lovely jobs: The rising polarization of work in Britain, *The Review of Economics and Statistics*, 89(1): 118-133
- 21 Michael et al. (2010) Has ICT Polarizes Skill Demand? Evidence from Eleven Countries over 25 Years, CEP Discussion Paper 987
- 22 Wolf (2011) Review of Vocational Education –The Wolf Report, Department for Education
- 23 Office for National Statistics, Labour Force Survey
- 24 Office for National Statistics (2000) Standard Occupational Classification 2000
- 25 Office for National Statistics (2010) Annual Survey of Hours and Earnings 2010
- 26 Office for National Statistics (2000) Standard Occupational Classification 2000
- 27 Office for National Statistics, Labour Force Survey
- 28 Office for National Statistics (2000) Standard Occupational Classification 2000
- 29 Office for National Statistics (2010) Annual Survey of Hours and Earnings 2010
- 30 Office for National Statistics (2000) Standard Occupational Classification 2000
- 31 Office for National Statistics, Labour Force Survey
- 32 Office for National Statistics (2000) Standard Occupational Classification 2000
- 33 Office for National Statistics (2010) Annual Survey of Hours and Earnings 2010
- 34 Office for National Statistics (2000) Standard Occupational Classification 2000
- 35 Office for National Statistics, Labour Force Survey
- 36 Office for National Statistics (2000) Standard Occupational Classification 2000
- 37 Office for National Statistics (2010) Annual Survey of Hours and Earnings 2010
- 38 Office for National Statistics (2000) Standard Occupational Classification 2000
- 39 Office for National Statistics, Labour Force Survey
- 40 Office for National Statistics (2000) Standard Occupational Classification 2000
- 41 Office for National Statistics (2010) Annual Survey of Hours and Earnings
- 42 Office for National Statistics (2000) Standard Occupational Classification 2000
- 43 Cognitive ability, as understood by this paper is independent of actual acquired knowledge, but has more to do with the mechanisms with which students acquire knowledge such as reasoning, perception and memory. A higher cognitive ability therefore necessarily leads on to a higher learning potential.
- 44 Lindqvist and Vestman (2011) The Labor Market Returns to Cognitive and Noncognitive Ability: Evidence from the Swedish Enlistment, *American Economic Journal: Applied Economics*, 3(1):101-128
- 45 Piaget (1983) Piaget's theory, in Mussen (ed.) *Handbook of Child Psychology*. 4th edition. Vol. 1. New York, NY: Wiley
- 46 CBI (2008, 23 June) Employers urge Government to rein in plans for Academic Diplomas, CBI News Release. Retrieved 14 February 2011 from <http://www.cbi.org.uk/ndbs/press.nsf/0363c1f07c6ca12a8025671c00381cc7/e4d176ad9bfe0f9d8025746a00448d88?OpenDocument>
- 47 Wolf (2011) Review of Vocational Education –The Wolf Report, Department for Education
- 48 O'Leary and Sloane (2009) The Return to a University Education in Great Britain, IZA Discussion paper 1199
- 49 Wolf (2011) Review of Vocational Education –The Wolf Report, Department for Education
- 50 Rajan (2011, 14 February) What Price Learning? The University Debate, *The Independent*. Retrieved 28 February from <http://www.independent.co.uk/news/education/education-news/what-price-learning-the-university-debate-2213734.html>
- 51 Rose and Betts (2004) The effect of high school courses on earnings, *The Review of Economics and Statistics*, 86(2): 497–513; O'Leary and Sloane (2009) The Return to a University Education in Great Britain, IZA Discussion paper 1199; Wolf (2011) Review of Vocational Education –The Wolf Report, Department for Education
- 52 O'Leary and Sloane (2009) The Return to a University Education in Great Britain, IZA Discussion paper 1199
- 53 Conlon et al. (2010) Return to BTEC vocational qualifications, London: London Economics
- 54 Wolf (2007) Diminished Returns: How Raising the Leaving Age to 18 Will Harm Young People and the Economy, Policy Exchange; Wolf (2011) Review of Vocational Education – The Wolf Report, Department for Education
- 55 Chowdry et al. (2009) Drivers and Barriers to Educational Success - Evidence from the Longitudinal Study of Young People in England. DCSF-RR102
- 56 Institute of Education (2010, 15 October) Millennium mothers want university education for their children. Retrieved 23 February 2011 from <http://www.ioe.ac.uk/newsEvents/45855.html>
- 57 Coughlan (2010, 17 November) Target for 40 university technical colleges, BBC News. Retrieved 23 February 2011 from <http://www.bbc.co.uk/news/education-11776453>
- 58 Wolf (2011) Review of Vocational Education –The Wolf Report, Department for Education

- 59 Mehan-Schmidt (2010, 26 February) A nation groans under the weight of reform, Times Education Supplement. Retrieved 19 January 2011 from <http://www.tes.co.uk/article.aspx?storycode=6037019>
- 60 Kultusminister Konferenz (2009) The Education System in the Federal Republic of Germany 2008: A description of the responsibilities, structures and developments in education policy for the exchange of information in Europe
- 61 Wiarda (2010, 21 November) A new class of education, The Guardian. Retrieved 10 January 2011 from <http://www.guardian.co.uk/commentisfree/2009/sep/21/germany-now-education>
- 62 Köhler (2009, 13 May) So funktioniert Berlins neue Sekundarschule, Berliner Morgenpost. Retrieved 19 January 2011 from [http://www.morgenpost.de/berlin/article1091813/So\\_funktioniert\\_Berlins\\_neue\\_Sekundarschule.html](http://www.morgenpost.de/berlin/article1091813/So_funktioniert_Berlins_neue_Sekundarschule.html)
- 63 Discussions with educational specialist at the German Embassy, London.
- 64 Bawden (2007, 18 December) The Basics no Longer Suffice, The Guardian. Retrieved 10 January 2011 from <http://www.guardian.co.uk/education/2007/dec/18/furthereducation.uk2>
- 65 Wolf (2011) Review of Vocational Education – The Wolf Report, Department for Education
- 66 Pilz (2009), 'After Abitur, first an apprenticeship and then university?' CEDEFOP Vocational Training - European Journal, 46: 41-65
- 67 Bradshaw et al. (2010) PISA 2009: Achievement of 15-Year-Olds in England. Slough: NFER
- 68 Kaplan et al. (2002) Teacher Quality, Teaching Quality, and School Improvement, Bloomington, IN: Phi Delta Kappa Educational Foundation
- 69 Domestic Policy Council – Office of Science and Technology Policy (2006) American Competitiveness Initiative
- 70 <http://www.whitehouse.gov/the-press-office/fact-sheet-race-top>
- 71 McKinsey and Co. (2007) How the world's best performing schools systems come out on top
- 72 Lichfield (2010, 6 January) Revolt at Sarkozy's attempts to open Grandes Ecoles to poorer students, The Independent. Retrieved 7 February 2011 from <http://www.independent.co.uk/news/world/europe/revolt-at-sarkozys-attempts-to-open-grandes-ecoles-to-poorer-students-1859016.html>
- 73 Fouché (2008, 31 October) Teachers in France are angry – Sarkozy treats them with scorn, The Guardian. Retrieved 7 February 2011 from <http://www.guardian.co.uk/education/2008/oct/31/france-baccalaureate-sarkozy-strike>
- 74 France 24 (2008, 3 September) More English, no more Saturday's in French schools, France 24. Retrieved 7 February 2011 from <http://www.france24.com/en/20080902-french-students-back-school-france-education-darcos>
- 75 Rollot (2007, 4 December) La France paralysée devant ses mauvais résultats scolaires, Le Monde. Retrieved 7 February 2011 from [http://www.lemonde.fr/societe/article/2007/12/04/la-france-paralysee-devant-ses-mauvais-resultats-scolaires\\_985481\\_3224.html](http://www.lemonde.fr/societe/article/2007/12/04/la-france-paralysee-devant-ses-mauvais-resultats-scolaires_985481_3224.html)
- 76 Cave (2001) Educational Reform in Japan in the 1990s: 'Individuality' and Other Uncertainties, Comparative Education 37 (2): 173-191
- 77 Monbush (1998) Ky iku Kaikaku Puroguramo (Education Reform Programme), report issued 28 April, Tokyo: Monbush. Quoted in Cave (2001) Educational Reform in Japan in the 1990s: 'Individuality' and Other Uncertainties, Comparative Education 37 (2): 173-191
- 78 Cave (2001) Educational Reform in Japan in the 1990s: 'Individuality' and Other Uncertainties, Comparative Education 37 (2): 173-191
- 79 Wray (1999) Japanese and American Education: attitudes and practices, Westport, CT: Berger & Garvin
- 80 England, Wales and Northern Ireland had the lowest levels of participation in post 16 mathematics while Scotland fared slightly better, with just under half of post 16 students studying mathematics. The Scottish figure is still below average. (Hodgen et al. (2010) Is the UK an outlier? An international comparison of upper secondary mathematics education, Nuffield Foundation)
- 81 Ibid.
- 82 Coughlan (2010, 7 December) UK schools fall in global ranking, BBC News. Retrieved 21 February 2011 from <http://www.bbc.co.uk/news/education-11929277>
- 83 Wolf (2011) Review of Vocational Education – The Wolf Report, Department for Education
- 84 Bassett et al. (2009) Core Business, Reform
- 85 Wolf (2011) Review of Vocational Education – The Wolf Report, Department for Education
- 86 The Economist (2007, 18 October) How to be top, The Economist. Retrieved 10 January 2011 from [http://www.economist.com/node/9989914?story\\_id=9989914](http://www.economist.com/node/9989914?story_id=9989914)
- 87 McKinsey and Co. (2007) How the world's best performing schools systems come out on top
- 88 The Economist (2007, 18 October) How to be top, The Economist. Retrieved 10 January 2011 from [http://www.economist.com/node/9989914?story\\_id=9989914](http://www.economist.com/node/9989914?story_id=9989914)
- 89 OECD (2010) Strong Performers and Successful Reformers in Education: Lessons from PISA for the United States
- 90 McKinsey and Co. (2007) How the world's best performing schools systems come out on top
- 91 Richardson (2010, 15 November) Top graduate teacher scheme 'boosts results', BBC News. Retrieved 10 January 2011 from <http://www.bbc.co.uk/news/education-11743616>
- 92 Akiba et al. (2007) Teacher Quality, Opportunity Gap, and National Achievement in 46 Countries, Educational Researcher, 36 (7): 369-387
- 93 Ibid.
- 94 OECD (2010) PISA 2009 Results: Overcoming Social Background – Equity in Learning Opportunities and Outcomes (Volume II)
- 95 Ibid.
- 96 DfE (2011) Number of pupils at the end of Key Stage 4 and percentage achieving an A\*-C grade in mathematics GCSE by IDACI decile of pupil residence, 2009/10 (Amended)
- 97 McKinsey and Co. (2007) How the world's best performing schools systems come out on top
- 98 DCSF (2008) Funding per Pupil
- 99 Bassett et al. (2010) Every Teach Matters, Reform
- 100 Ibid.
- 101 Blatchford et al. (2009) Deployment and Impact of Support Staff in Schools: The Impact of Support Staff in Schools (Results from Strand 2, Wave 2), Department for Children, Schools and Families.
- 102 Wolf (2011) Review of Vocational Education – The Wolf Report, Department for Education
- 103 Telegraph View (2011, 12 January) Michael Gove exposes the shame of rising GCSE results, The Telegraph. Retrieved 13 January 2011 from <http://www.telegraph.co.uk/comment/telegraph-view/8255960/Michael-Gove-exposes-the-sham-of-rising-GCSE-results.html>
- 104 DfE (2011) GCSE and Equivalent Results in England, 2009/10 (Revised)
- 105 DfE (2010) The Importance of Teaching: The Schools White Paper 2010
- 106 Porter et al. (2010, 24 November) Pupils to learn a language in GCSE shake up, The Telegraph. Retrieved 7 January 2011 from <http://www.telegraph.co.uk/education/8155517/Pupils-to-learn-a-language-in-GCSE-shake-up.html>
- 107 DfE (2010) The Importance of Teaching: The Schools White Paper 2010
- 108 CBI (2010, 17 August 2010) CBI calls for action on state school science education. Retrieved 24 February 2011 from [http://highereducation.cbi.org.uk/media/press\\_release/00299/](http://highereducation.cbi.org.uk/media/press_release/00299/)

- 109 Wolf (2011) Review of Vocational Education –The Wolf Report, Department for Education
- 110 In 1996 57 per cent of all A Level entries were in core academic subjects by 2002 the figure has dropped to 50 per cent (DfE (2010) GCE/Applied GCE A/AS and Equivalent Examination Results in England, 2009/10 (Provisional))
- 111 BBC News (2010, 20 August) A-levels: Rising grades and changing subjects, BBC News. Retrieved 24 February 2011 from <http://www.bbc.co.uk/news/education-11011564>
- 112 Hodgen et al. (2010) Is the UK an outlier? An international comparison of upper secondary mathematics education, Nuffield Foundation
- 113 <http://www2.lse.ac.uk/study/undergraduate/howToApply/lseEntryRequirements.aspx>
- 114 Russell Group (2011) Informed Choices: A Russell Group guide to making decisions about post-16 education, 2011
- 115 CBI (2010, 17 August 2010) CBI calls for action on state school science education. Retrieved 24 February 2011 from [http://highereducation.cbi.org.uk/media/press\\_release/00299/](http://highereducation.cbi.org.uk/media/press_release/00299/)
- 116 Ibid.
- 117 <http://www2.lse.ac.uk/study/undergraduate/howToApply/lseEntryRequirements.aspx>
- 118 Russell Group (2011) Informed Choices: A Russell Group guide to making decisions about post-16 education, 2011
- 119 HEFCE (2010) Trends in young participation in higher education: core results for England
- 120 Based on figures from the OECD and the Australian Government's Department for Education, Employment and Workplace Relations. Calculations author's own.
- 121 Aud et al. (2010) The Condition of Education 2010 (NCES 2010-028). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC. Table A-20-1
- 122 Harris (2010) What more can be done to widen access to highly selective universities?, Office for Fair Access
- 123 Ibid.
- 124 CBI (2009) Stronger together, Businesses and universities in turbulent times: A report from the CBI Higher Education Task Force
- 125 Ibid.
- 126 Dearing (1996) Review of Qualifications for 16-19 Year Olds: Summary Report, School Curriculum and Assessment Authority
- 127 [http://www.london.diplo.de/Vertretung/london/en/06/Study/Education\\_\\_seite.html](http://www.london.diplo.de/Vertretung/london/en/06/Study/Education__seite.html)
- 128 Kultusminister Konferenz (2009) The Education System in the Federal Republic of Germany 2008: A description of the responsibilities, structures and developments in education policy for the exchange of information in Europe
- 129 Bosanquet et al. (2008) Shifting the unequal state: From public apathy to personal capability, Reform
- 130 Wolf (2011) Review of Vocational Education –The Wolf Report, Department for Education
- 131 Ibid.
- 132 In 2009/10 89 per cent of students achieved 5 GCSE passes including English and mathematics (DfE (2011) GCSE and Equivalent Results in England, 2009/10 (Revised))
- 133 Tomlinson (2004) 14-19 Curriculum and Qualifications Reform: Final Report of the Working Group on 14-19 Reform, Department for Education and Skills
- 134 Stewart (2010, 26 February) Tomlinson turns on Diplomas, Times Education Supplement. Retrieved 24 February 2011 from <http://www.tes.co.uk/article.aspx?storycode=6036975>
- 135 Murray (2010, 10 August) University technical college is set to make its debut, The Guardian. Retrieved 13 January 2011 from <http://www.guardian.co.uk/education/2010/aug/10/university-technical-college>
- 136 BBC News (2011, 6 January) GCSEs should be scrapped, Estelle Morris says. Retrieved 13 January 2011 from <http://www.bbc.co.uk/news/education-12129930>
- 137 Smithers et al. (2010) , Choice and Selection in School Admissions: the experience of other countries, The Sutton Trust
- 138 Wolf (2011) Review of Vocational Education –The Wolf Report, Department for Education
- 139 Murray (2010, 10 August) University technical college is set to make its debut, The Guardian. Retrieved 13 January 2011 from <http://www.guardian.co.uk/education/2010/aug/10/university-technical-college>
- 140 OECD (2010) Viewing the United Kingdom schools system through the prism of PISA
- 141 Ibid.
- 142 Ibid.
- 143 Collins (2011, 14 January) These UTCs could be a real technical breakthrough, The Times. Retrieved 14 January 2011 from <http://www.thetimes.co.uk/tto/opinion/columnists/philipcollins/article2874169.ece>
- 144 Dutton (2010, 6 November) The silent truth of the Finnish classroom, Times Education Supplement. Retrieved 13 January 2011 from <http://www.tes.co.uk/article.aspx?storycode=6064228>
- 145 Wolf (2011) Review of Vocational Education –The Wolf Report, Department for Education
- 146 Ibid.

## About the author

Elizabeth Truss is the Member of Parliament for South West Norfolk. She was previously Deputy Director of the think tank, Reform, where she co-authored 'The value of mathematics', 'A new level' and 'The mobile economy' amongst other reports. Elizabeth previously worked for Shell and Cable and Wireless in a variety of commercial roles and read Politics, Philosophy and Economics at Oxford University.

## Acknowledgements

The author thanks Chris Nicholson and CentreForum, Dr Tim Leunig, Dale Bassett and Prof Alison Wolf for reading drafts and their valuable suggestions, Prof David Autor for generously providing the data for figures 1 and 3, and Alexander Barratt, James Earle, Anna Williams and Patrick Scott for their research assistance. The views expressed and any errors are the author's alone.