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Teacher Demand and Supply: Improving Teaching Quality and Addressing Teacher Shortages

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TEACHER DEMAND AND SUPPLY: IMPROVING TEACHING QUALITY AND ADDRESSING TEACHER SHORTAGES

A literature review and a conceptual framework for future work

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INTRODUCTORY NOTE

The attached report was prepared by the OECD Secretariat in support of the Education Committee's activity *Teachers: Managing Supply and Demand* for its 2000-2001 Programme of Work. This work was undertaken by the Education and Training Policy Division in the Directorate for Education. It provided background for launching a new OECD activity *Attracting, Developing and Retaining Effective Teachers* in March 2002. The overall objective of this work is to provide policy makers with information and analysis to assist them in formulating and implementing teacher policies leading to quality teaching and learning at the school level. The activity is intended to: (i) synthesise research on issues related to policies concerned with attracting, recruiting, retaining and developing effective teachers; (ii) identify innovative and successful policy initiatives and practices; (iii) facilitate exchanges of lessons and experiences among countries; and (iv) identify policy options. The final synthesis report is to be published in 2004. Detailed information about the activity is provided in the following internet site:
www.oecd.org/els/education/teacherpolicy

This report consists of a review of the academic and policy literature in the broad area of teacher demand and supply. It is descriptive in nature and does not offer judgements on policy. It aims to provide an account of the current state of policy research on issues related to the broad domain of teacher demand and supply. Some limitations of this review should be noted. First, the empirical evidence is mostly drawn from research that is specific to the United States. Second, despite its exclusive focus on pre-tertiary education, more specific issues pertaining to the domain of early childhood education and care are not addressed.

ABSTRACT

This paper provides an extensive review of the most relevant issues involved in the management of teacher demand and supply at the pre-tertiary level. First, it proposes a conceptual framework for distinguishing among, defining and relating the different relevant factors. Second, it identifies trends and policy concerns regarding the quality of the teaching workforce across the OECD area. Third, it provides an account of current empirical evidence on numerous aspects (e.g. class size, reward structure, working conditions, teacher education, certification procedures, organisation of schools, evaluation systems, structure of labour market, teaching and learning practices) impacting on the teaching profession. Some concerns about maintaining an adequate supply of good quality teachers emerge. It is the case that in a great number of countries the age profile of teachers is skewed towards the older end of the age-range and signs point to a recent worsening of the situation. In addition, the relative attractiveness of the profession, as far as the salary dimension is concerned, has declined substantially in the most recent years. Other evidence indicates that, at least in some countries, a substantial share of the teaching workforce does not hold a regular teaching license and the proportion of "out-of-field" teaching assignments is strikingly high in many subject key areas. It is also emphasised that a teacher shortage is difficult to measure and raises quality as well as quantity concerns. Given that teacher quality is a critical factor in determining student learning, it is entirely appropriate that the educational authorities in the countries with the greatest difficulties develop strategies to guarantee a sufficient supply of quality teachers. This report identifies a broad set of policies that should be given serious consideration to achieve that objective. Finally, this paper also sheds light on the current availability of data on teachers at OECD and relevant data needs for a future quantitative analysis.

RESUME

Ce rapport passe en revue les domaines les plus pertinents qui se rapportent à la gestion de l'offre et de la demande d'enseignants dans l'enseignement pré-universitaire. Premièrement, il propose un cadre conceptuel pour définir, distinguer et relier entre eux les différents aspects de cette gestion. Deuxièmement, il identifie les tendances et les préoccupations de politiques concernant la qualité du corps enseignant dans la zone de l'OCDE. Un troisième objectif consiste à rendre compte de l'évidence empirique sur de nombreux aspects (par exemple la taille des classes, les systèmes de primes, les conditions de travail, la formation et la certification des enseignants, l'organisation des écoles, les systèmes d'évaluation, la structure du marché du travail, les pratiques d'enseignement et d'apprentissage) qui ont un impact sur la profession enseignante. Certaines préoccupations se révèlent concernant le maintien d'une offre adéquate d'enseignants de bonne qualité. Dans un grand nombre de pays, la structure par âge du corps enseignant est déséquilibrée par le poids de la fraction plus âgée et il y a des indices d'une aggravation de cette situation. De plus, l'attrait relatif de la profession, mesuré par le niveau de rémunération, a décliné de manière importante ces dernières années. Par ailleurs, on constate, au moins dans certains pays, qu'une partie importante du corps enseignant ne possède pas les qualifications normalement requises et que la proportion d'enseignants affectés en dehors de leur domaine est remarquablement élevée dans beaucoup de matières importantes. Il est aussi souligné qu'une pénurie d'enseignants est difficile à mesurer et soulève des problèmes à la fois qualitatifs et quantitatifs. Étant donné que la qualité des enseignants est un des facteurs plus déterminants des résultats des élèves, il est absolument pertinent pour les responsables de l'enseignement dans les pays faisant face à de plus grandes difficultés de développer des stratégies visant à garantir une offre suffisante d'enseignants de qualité. Ce rapport identifie un large ensemble de politiques auxquelles une attention particulière devrait être donnée de façon à atteindre cet objectif. Dernièrement, ce rapport apporte aussi éclairage sur la disponibilité des données sur les enseignants à l'OCDE et sur celles qui sont nécessaires à une analyse quantitative future.

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EXECUTIVE SUMMARY

1. This report is about the management of teacher demand and supply at the pre-tertiary level. It proposes a conceptual framework for distinguishing among, defining, and relating, the various aspects involved in the management of teacher demand and supply. The ultimate goal, in this context, is considered to be the improvement of the quality of the teaching. Five main areas are involved: "demand for teachers", "potential supply of teachers", "structural elements shaping the market for teachers", the subsequent "current teaching force", and "teaching quality" resulting from the interaction between "teacher quality" and "teaching environment". A second purpose, following the identification of the main policy issues, is to provide an account of current empirical evidence on issues relevant for the management of teacher demand and supply. A final goal is to assess the current availability of data on teachers at OECD and to identify a comprehensive set of data elements relevant for a meaningful future quantitative analysis.

2. The investigation carried out in this report resulted in one crucial finding: teacher quality is a critical factor in determining student learning. Therefore, the recruitment and retention of good quality teachers is key to the improvement of school systems. This reality gains even more importance given the widespread belief that several countries in the OECD area suffer from shortages of teachers. It is the case that in a great number of countries the age profile of teachers is skewed towards the older end of the age-range and signs point to a recent worsening of the situation. As a consequence, the future teacher supply is likely to be affected, as proportionately more teachers reach retirement in a given year. In addition, the relative attractiveness of the profession, as far as the salary dimension is concerned, has declined substantially in the most recent years. Other evidence indicates that, at least in some countries, a substantial share of the teaching workforce does not hold a regular teaching license and the proportion of "out-of-field" teaching assignments is strikingly high in many subject key areas. In light of these trends, it seems amply justified the development of an investigation on what could be the best strategies for the management of the demand and supply of teachers. In this report, it was possible to identify some empirical evidence that helps us in defining a broad set of policies that should be given serious consideration in the management of teacher demand and supply.

3. An important finding is the fact that policy tools on the demand side look far less promising in improving student outcomes than policy tools used on the supply side or on the structure of markets for schooling. Specifically, evidence suggests that the impact of across-the-board class size reductions – the main policy tool on the demand side – is small and very expensive. Considering the facts that class size reductions are beneficial in specific circumstances (for example, in lower grade levels or for lower-income and more disadvantaged students) and that broad reductions are very expensive, there is an increasing consensus around the idea that class size reductions should be targeted at those that benefit the most. It turns out that the impact of policies on the supply side (for example, policies improving the attractiveness of the teaching profession) and on the structure of markets for schooling (for example, policies decentralising decision-making) looks more promising in improving teaching quality.

4. Evidence on the career decisions of potential teachers, teachers, and former teachers shows that they do respond to incentives. Salaries and opportunity costs strongly influence who goes into teaching, who stays in teaching, and who returns to teaching after a career interruption. Others factors, such as opportunities in the teaching career, working conditions, teacher training and certification procedures, and the status of the profession also play a very relevant role in the supply decisions of potential teachers. In

addition, other evidence shows that responsiveness to incentives greatly depends on personal characteristics. The teacher's probability of exiting the profession is higher in the first few years of the career. More academic able teachers and those working in subject areas which provide more opportunities outside education are more likely to leave the profession and less likely to come back once they leave. Another important aspect is that women and men respond differently to incentives. These facts have important implications for the formulation of policies.

5. The policy making challenge is to design incentives to attract effective candidates and former teachers to the pool of those who want to teach, exclude from the pool those who lack the skills to teach, and retain the good quality teachers currently in the profession. In accomplishing this goal, educational administrators need to devise an incentive structure that shapes the teaching workforce with the appropriate distribution of experience and qualifications. For example, taken into account that young talented teachers leave the profession at higher rates, the wage structure should aim at reducing teacher attrition in the early years of teachers' careers. Also, since the recruitment of women is vital to the maintenance of the labour force in teaching, the incentive structure should take into account that women many times leave the profession for family reasons. It would thus be pertinent to increase the "flexibility" of the profession or provide services such as child-care.

6. In turn, teacher training and certification also have an important role to play. Aspiring teachers need incentives to undertake high-quality training and it would be desirable to introduce licensing requirements that discourage those who lack the skills necessary to teach effectively. In this domain, reforms might include higher admission standards for teacher education programmes, more rigorous course content, and basic skills and subject matter competency testing for teacher certification. The policies can be complemented by the relaxation of licensing requirements for individuals demonstrating promise in other ways. Likewise, professional development has been identified as a powerful resource in providing opportunities for more experienced teachers to gain new skills and thus should be used as an important tool in retention policies. Moreover, many studies emphasise the fact that it is desirable that efforts be undertaken to enhance the public image of the teaching career. This would essentially mean empowering teachers and give schools more autonomy.

7. In fact, this report sheds light on the increasing importance of the organisation of schools. It is shown that the organisational conditions of schools have an impact on teacher turnover and that performance-based accountability systems might be a valid option for improving educational outcomes. Policy makers are increasingly advocating the need for decentralising decision-making. Suggestions include that schools be given more authority in the management of issues such as development of own hiring/recruitment policies, definition of salary levels, reward structure, systems of evaluation, or investment in continuing education. In particular, policies leading to the improvement of recruitment practices are extremely relevant as they provide the link between salary schemes and teacher quality. According to the evidence shown in this document, hiring practices can be very inefficient in linking teacher compensation to teacher quality.

8. In this way, if schools are to move forward attracting and retaining higher-quality teachers, they will almost certainly have to build in stronger performance incentives for school personnel. This can be part of a wider range of policies introducing elements of competition in educational markets. Besides, the introduction of productivity-based incentives and increased autonomy in the management of schools, such elements could include wider choice of schools, pay differentiation to account for shortages in specific subject areas, grade levels, or regions of the country, and schools directly competing for teachers. In this context, the structure of careers could include market-driven compensation, performance-based accountability, multiple career paths, and on-going applied professional growth.

9. It is widely recognised that incentives are key to results – whether in education or in other aspects of life. And, education policy, in the context of the management of teacher demand and supply, seems to be engaging in a trend of deregulation with an emphasis on a set of mechanisms based on incentives. Along these lines, policy makers stress the importance of explicitly linking such incentive schemes to student performance, the ultimate goal for any educational system.

10. This document also sheds light on the current availability of data at OECD and relevant data needs for a future quantitative analysis. The availability of good data is essential for characterising current teaching workforces and for designing policies aiming at improving school systems. For instance, despite the belief that several countries suffer from teacher shortages, little concrete information exists on the exact nature and severity of shortages. The areas best covered by the current availability of data are the demographic profile of teachers, demand-side elements (for example, student enrolment, composition of the school-age population, instructional time required for pupils, teachers' teaching loads, enrolment rates), and compensation of teachers.

11. The analysis also identifies several data gaps. First, little or no data are available on flows in and out of the profession. Data elements such as attrition/retention rates, characteristics of leavers, reasons for leaving/entering/re-entering the profession, reasons for dissatisfaction, potential supply of new graduates, potential supply of returnees, or percentage of newly certified teachers that enter the profession are not available. Secondly, no data seem to exist on the outcomes of teacher recruitment processes. Such data would, for instance, consist of the number of "difficult to fill" vacancies, proportion of positions filled by teachers on "emergency certification", proportion of "out-of-field" assignments, or methods used to cover vacancies "difficult" to fill. In addition, important aspects of the profile of the teaching force such as the license status of teachers, percent of teachers without qualifications in their teaching field are not readily available. Other important data gaps include information on teacher training, teacher certification, existence of market mechanisms, teacher recruitment practices, organisational structure of schools, professional development activities, teaching and learning practices, standards and assessment practices, and partnerships.

1. INTRODUCTION

12. Teacher shortages constitute a major concern of the current reform movement in education. There is a widespread belief that several countries in the OECD area suffer from shortages of teachers in particular subject areas, grade levels, or regions of the country. Although there is little concrete information on the exact nature and severity of teacher shortages, policy makers are devoting increasing attention to the development of policies directly addressing shortages.

13. The fact of, or potential for, teacher shortages is a major consideration in any nation's aspirations to attain, or maintain, an educational system of high quality, namely when our knowledge-based societies are placing new demands on individuals' abilities and skills. Teachers constitute the core of the educational system and their importance in student performance has been widely confirmed by many credible research studies.[1] In addition, a shortage of teachers typically translates into either larger class sizes or the hiring of less qualified candidates. Both scenarios potentially lead to harmful effects on educational quality. It is therefore, entirely appropriate for education authorities, policy makers, administrators, and practitioners alike to take teacher shortages very seriously, and try to minimise this problem. In this context, the relevant policy issue is how to improve teacher quality while simultaneously maintaining a sufficient supply of teachers to meet demand.

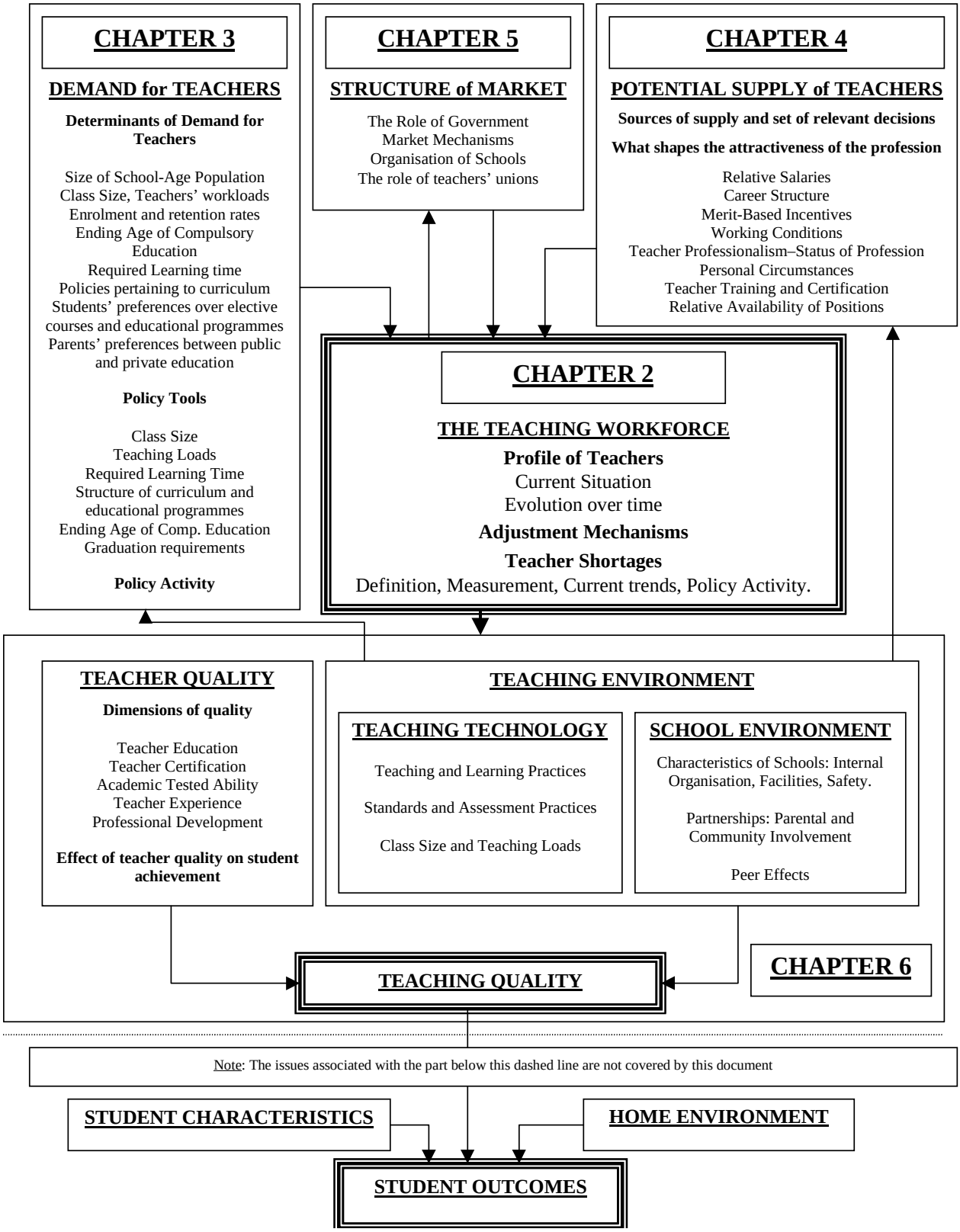
14. To study and understand the factors involved in the management of teacher demand and supply, it is first necessary to have a conceptual framework for distinguishing among, defining, and relating, the various aspects involved in the teaching profession. This document proposes such conceptual framework. A second purpose, following the identification of the main policy issues, is to provide an account of current empirical evidence on issues relevant for the management of teacher demand and supply. The emphasis is on the impact of the several policy tools available to policy makers on student performance or teaching quality. Finally, the third main purpose is to assess the current availability of data on teachers at OECD and to identify a comprehensive set of data elements relevant for a meaningful future quantitative analysis. Some of the data currently available are used, in this report, with purely descriptive purposes.

15. The proposed conceptual framework is shown in chart 1.[2] The ultimate goal, in the context of the management of teacher demand and supply, is considered to be the improvement of the quality of the

[1] In recent work, Rivkin, Hanushek, and Kain (2000) conclude that teacher quality is the most important within-school factor explaining student performance. See section 6.2.2. for a detailed analysis.

[2] In this same document, some other charts help summarising the factors involved and how they relate. Chart 2, in chapter 3, shows what are the determinants of the demand for teachers. Chart 3, in chapter 4, describes the sources of the potential supply of teachers. Chart 4, in chapter 5, summarises the policy tools available to educational authorities for the improvement of teaching quality. This chart can be particularly useful as, to some extent, it outlines all issues addressed in this report. Finally, chart 5, in chapter 6, summarises the main factors directly affecting the quality of the teaching.

Chart 1 - Managing Teacher Demand and Supply: A Conceptual Framework



teaching, the channel through which educational systems achieve their primary objective of improving student learning outcomes. This framework identifies five inter-related main areas. First, the "demand for teachers" deals with the aspects that determine the number of teachers needed for educational systems to respond to the education needs of the entire school-age population. Second, the "potential supply of teachers" deals with the factors that define the number of potential individuals willing to teach in current educational systems. Third, the "structure of the market for teachers" identifies the elements that shape the mechanisms through which demand and supply interact, namely teacher recruitment practices. Such set of elements includes the extent to which the government intervenes in the market for teachers, the degree of autonomy of schools, or the role of teachers' unions. The fourth main area of the proposed framework, "the teaching workforce" corresponding to the profile of the current workforce, is the result of the interactions between demand for and supply of teachers, given the current market structure. In particular, the current teaching workforce is characterised by its quality – "teacher quality" in chart 1 – one of the factors defining "teaching quality", the fifth component of the proposed framework. In addition to "teacher quality", "teaching quality" depends on two additional sets of factors: "teaching technology" and "school environment". "Teaching technology" is associated with factors such as teaching, learning and assessment practices, or academic standards. In turn, "school environment" relates to the organisation of schools and their relationship with communities. Finally, it is important to recognise that, as identified in chart 1, student learning outcomes depend not only on teaching quality but also on two other elements that go beyond the scope of this report: "student characteristics" and "home environment".

16. As described, supply and demand for teachers are complex because they depend on many variables many of which can change unexpectedly. Such variables include economic policy, population, education funding, class size, teaching technology, organisation of schools, education market mechanisms, partnerships, teacher training and certification, for example.

17. The approach is intentionally comprehensive. The major objective for any educational system is to improve student outcomes through the main channel available, teaching quality. In the context of teacher demand and supply, the purpose should be exactly the same. In particular, the purpose should be the development of a set of policies that ultimately maximise the quality of the teaching the students receive. This set of policies cannot be restricted to policies limited to improve the attractiveness of the profession but should be broader in their scope to take into consideration the functioning of markets, teaching technologies, and school environment, for example. The fact is that all the elements considered interact and the model-type of teacher depends, for instance, on what type of teaching technologies are to be used or what structure for educational markets might be desirable.

18. The organisation of this document is as follows. Simply put, each chapter corresponds to each "main box" in chart 1. Chapter 2 seeks to characterise current teaching workforces. A profile of teaching workforces in most OECD countries along with its recent evolution over time is provided. Following a brief description on how schools bring demand and supply into line, the focus is on the examination of teacher shortages. A definition for teacher shortages is provided together with a description of the current best indicators to assess their severity. Finally, the remaining analysis describes current trends and provides a short account of policy activity aiming at alleviating shortages.

19. Chapter 3 deals with the demand for teachers. The first part provides an account, complemented with some descriptive data trends, of the main determinants of the demand for teachers. Among others, the main ones are shown to be class size, teachers' workloads, required learning time for students, and the size of the school-age population. This chapter then focuses on the main policy tool used on the demand side: class size. A detailed account of the current status of the very intense class size debate is provided.

20. In the next chapter, the supply of teachers is addressed. The main purpose is to identify the main factors that shape the attractiveness of the profession. This is done by providing a detailed description, as

illustrated in the academic and policy literatures, of the empirical evidence on the impact of a number of factors on the supply decisions of potential teachers. These factors are relative salaries, opportunities outside education, career structure, working conditions, teacher training and certification, the status of the profession, and the relative availability of positions. In this chapter, the main sources of supply of teachers are outlined and the set of decisions bringing individuals into the classroom is described.

21. Chapter 5 concentrates on the structural elements that shape the market for teachers. It starts by looking at the role of the several levels of government focusing on the policy tools they have available. It then moves onto the potential role of the market mechanisms that have been introduced in some countries, namely school choice. The next section concentrates on how the organisation of schools can impact the market for teachers and the chapter ends by analysing the important role unions play in this market. Wherever possible, empirical evidence is provided.

22. Chapter 6 is devoted to the quality aspects of teaching and seeks to describe the empirical evidence linking teacher quality and teaching environment to student outcomes. It starts by describing the measurable dimensions of teacher quality. It then addresses the crucial issue of whether or not there is empirical evidence confirming the relevance of teacher quality for student achievement. Next, a literature review about the effects of measurable characteristics of teachers on student outcomes is provided. The second part of the chapter involves a description of the main elements composing what is called “teaching environment” and some empirical evidence on their impact on students’ achievement. The main objective is to provide a brief account of what other factors besides teacher quality have a significant impact on the learning of students. Finally, the assessment of currently available data and the identification of relevant data needs are developed in a separate appendix.

23. It is important to emphasise that this document is descriptive in its intentions and does not offer judgements on policy. It essentially provides an account of the current state of policy-related research on issues related to the broad domain of teaching quality at the pre-tertiary level. At times, it uses technical language drawn from economic analysis. However, the frequent references to terms such as “markets” is in no way intended to cast doubt on the broader aims of education or the importance of education as a major social area in which governments have a fundamental role to play.

2. THE TEACHING WORKFORCE

2.1. Introduction

24. This chapter focuses on the characterisation of the teaching workforce that results from the current equilibrium between demand and supply of teachers. The analysis starts by providing a profile of teaching workforces in most OECD countries and its recent evolution over time. It then concentrates on the description of the mechanisms used by schools systems to bring supply and demand of teachers into line. It then turns to an examination of teacher shortages. It starts by explaining what teacher shortages translate into and emphasises that measuring their severity is difficult and data on potential indicators are not readily available. Limited by the little data available, the investigation pursues with a description of current trends that potentially provide information for understanding the severity and the nature of teacher shortages. Finally, a short description of policy actions in some OECD countries expressly aiming at alleviating shortages is provided.

2.2. Profile of Teachers

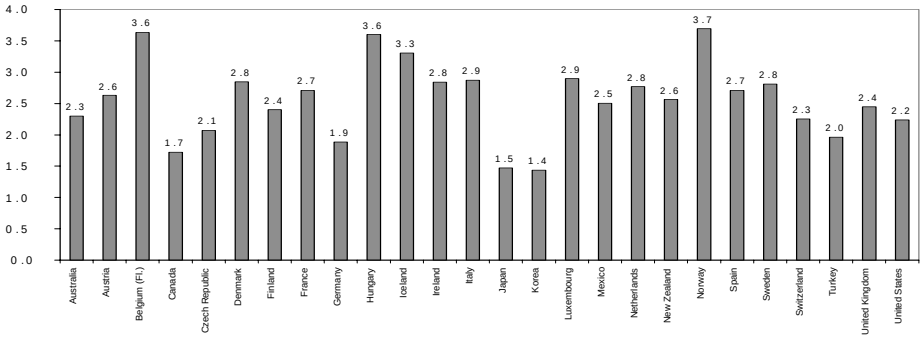
2.2.1. Current Situation

25. In this subsection, a demographic profile of teachers in the several OECD countries is provided.[3] Monitoring the basic demographic characteristics of teachers is critical in devising policies targeted at managing teacher supply and demand, improving teaching quality, and ensuring the capacity of existing staff to meet new challenges. For example, the age distribution of the teaching workforce provides a basis for assessing how acute retirement-related supply shortages can be. In the same way, the proportion of female teachers might serve as an indicator of to which extent women should be the targets of any policies addressing key matters.

26. The size of the teaching workforce, in each country, is very significant. As can be seen in figure 2.1, teaching staff in primary and secondary levels of education make up between 1.4 (in Korea) and 3.7 (in Norway) percent of the total labour force.

[3] An excellent reference providing a profile of teachers for the 1980s can be found in OECD (1990).

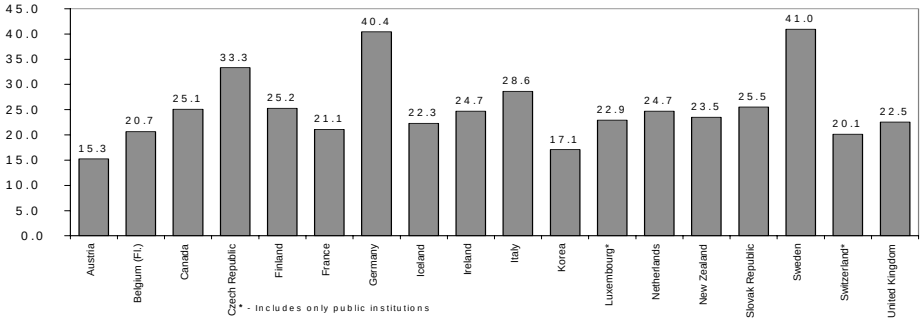
Figure 2.1: Teaching Staff in Primary and Secondary Education as a percentage of the total Labour Force, 1999



Source : OECD Education Database.

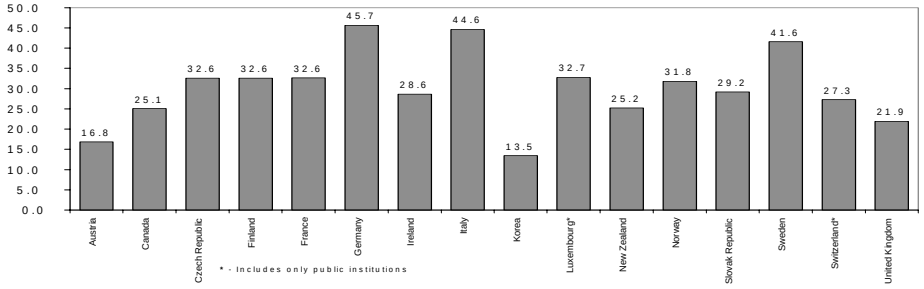
27. Considering the evidence shown in figures 2.2 to 2.4, it is clear that a considerable but limited number of countries (for example, Sweden, Germany, Italy, Czech Republic, Norway) face an aged teaching force, a phenomenon typically more severe in secondary education. For example, the share of teachers aged 50 and over in Sweden for upper secondary education reaches 49 per cent. Other countries (for example, Austria, Korea, United Kingdom) face less aged teaching forces.

Figure 2.2: Percentage of teachers 50-years-old and over, Public and Private sectors, Primary Level of Education, 1999



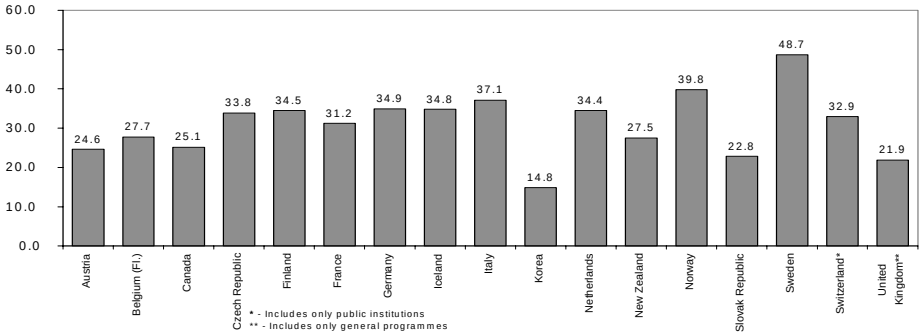
Source : OECD Education Database.

Figure 2.3: Percentage of teachers 50-years-old and over, Public and Private sectors, Lower Secondary Level of Education, 1999



Source: OECD Education Database.

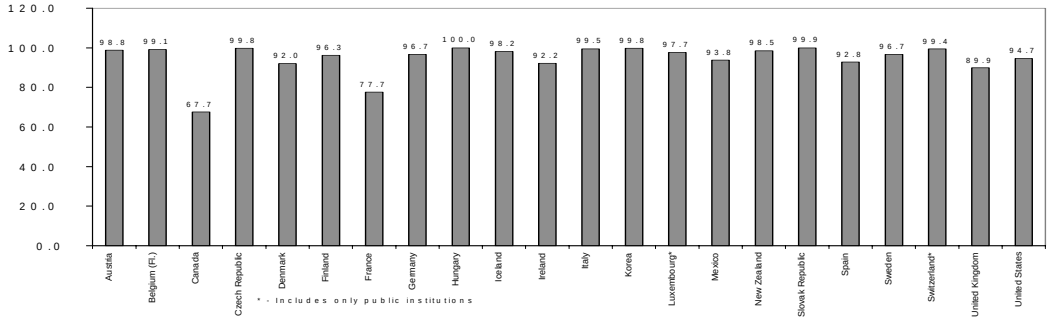
Figure 2.4: Percentage of teachers 50-years-old and over, Public and Private Sectors, Upper Secondary Level of Education, 1999



Source: OECD Education Database.

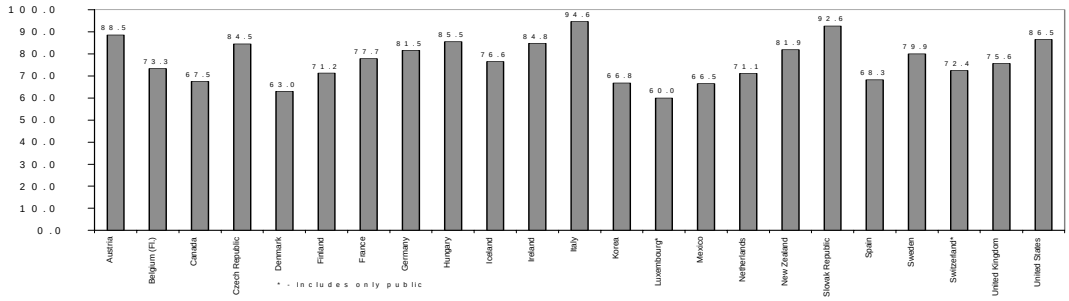
28. Teaching has traditionally been a female-dominated profession and continues to be so (see figures 2.5 to 2.8). Women dominate the profession in pre-primary and primary schools. In fact, at these levels, in most countries for which data are available, a share of 80 percent or more of female teachers is typical (for example, Italy, Austria, Czech Republic, Germany, Hungary, New Zealand). The picture becomes progressively different at the secondary level. While at the lower secondary level, women are still significantly more represented than men, at the upper secondary level there are many countries for which men teaching out-number women (for example, Korea, Denmark, Germany, Netherlands, Switzerland).

Figure 2.5: Percentage of Women among teaching staff, Public and Private sectors, Pre-primary education, 1999



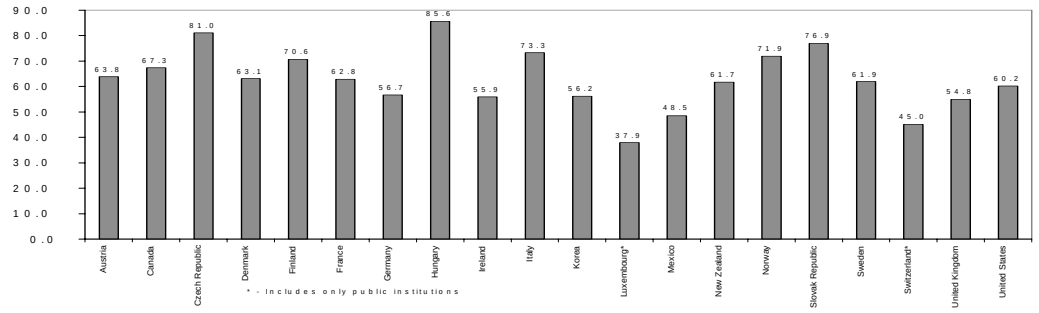
Source: OECD Education Database.

Figure 2.6: Percentage of Women among teaching staff, Public and Private sectors, Primary education, 1999



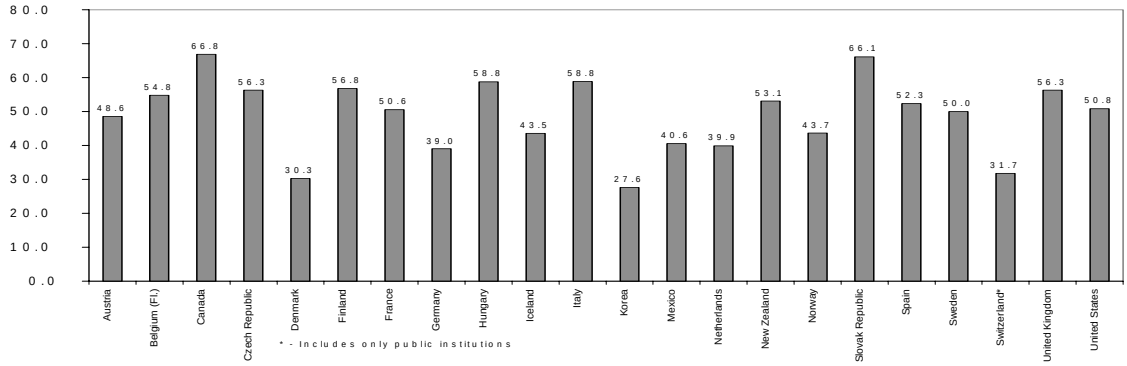
Source: OECD Education Database.

Figure 2.7: Percentage of Women among teaching staff, Public and Private sectors, Lower Secondary education, 1999



Source: OECD Education Database.

Figure 2.8: Percentage of Women among teaching staff, Public and Private sectors, Upper secondary education, 1999



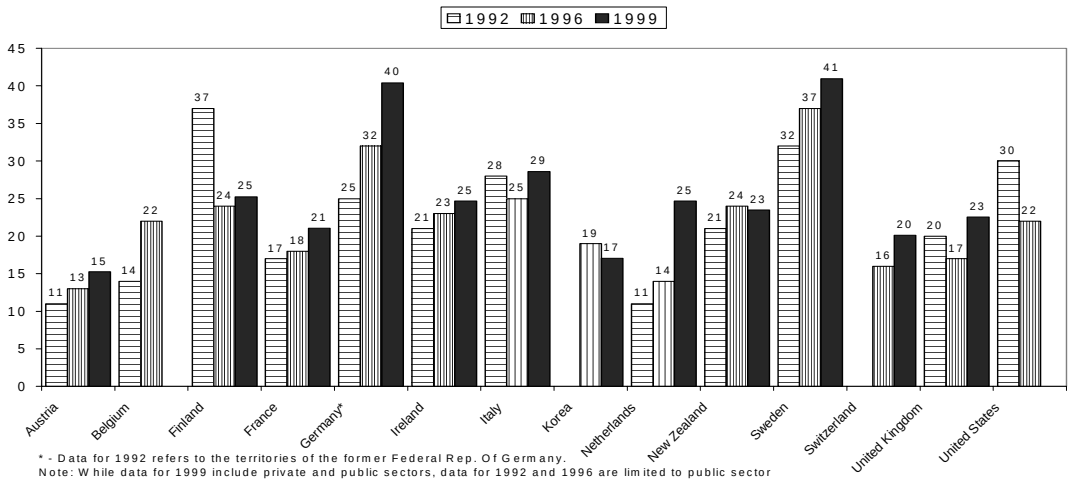
Source: OECD Education Database.

2.2.2. Recent Evolution over time

29. In this subsection, the focus is on the recent evolution over time of the demographic characteristics of teachers. The relevant questions are whether teaching forces are ageing and whether the teaching workforce is becoming more "feminised".

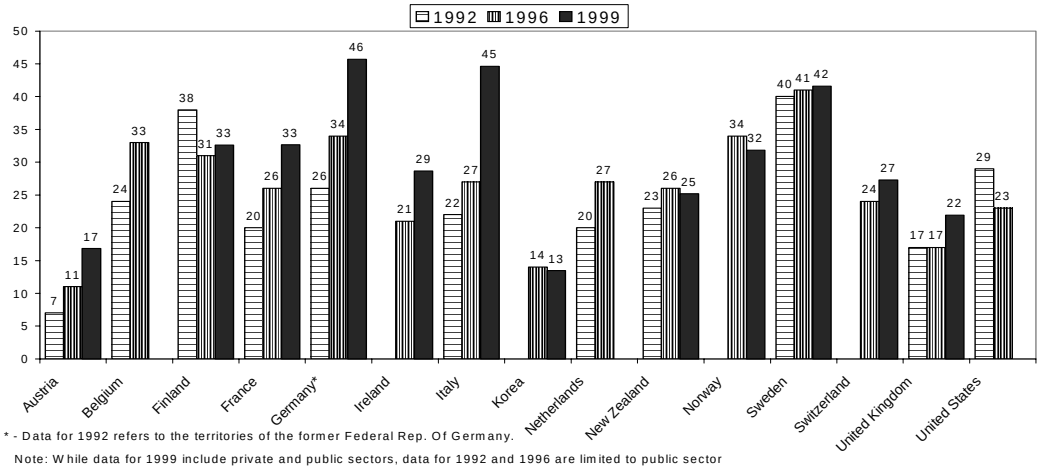
30. Ageing trends for primary and lower secondary sectors are depicted in figures 2.9 and 2.10. For the short time span under consideration, some countries show a clear ageing trend (Sweden in primary, Germany in both educational sectors, Italy and France in lower secondary). Other countries go through a less pronounced ageing trend (Ireland, Austria, Switzerland for both sectors, France in primary education). On the other hand, some countries do not reveal any marked ageing trend (for example, New Zealand, United Kingdom, Korea). Thus, while ageing trends can certainly not be generalised, it is the case that in a great number of countries the age profile of teachers is skewed towards the older end of the age-range and signs point to a progressive worsening of the situation in the last few years.

Figure 2.9: Percentage of teachers 50-years-old and over, time trends, Primary Level of Education



Source: OECD Education Database.

Figure 2.10: Percentage of teachers 50-years-old and over, Time trends, Lower Secondary Level of Education

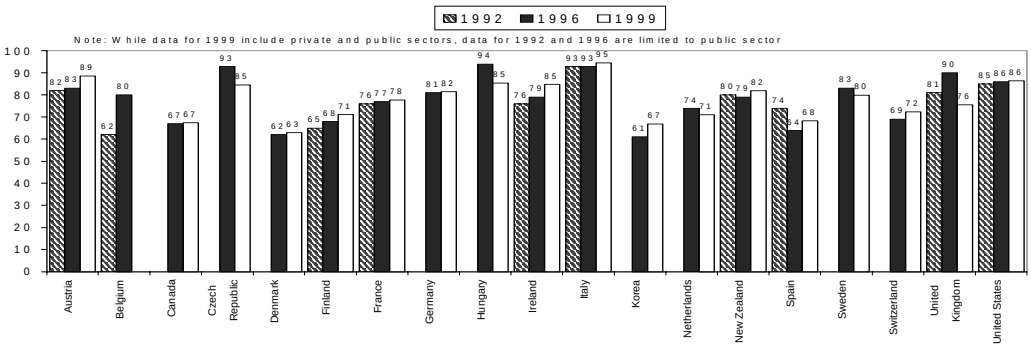


Source: OECD Education Database.

31. The ageing of the teaching workforce has several effects. First, it has budgetary implications as with incremental salary scales, a higher average age for teachers leads to greater expenditure. Secondly, the need to adapt current teachers to meet the new challenges is likely to require more resources. Finally, and most importantly, the future teacher supply is likely to be affected as proportionately more teachers reach retirement in a given year.

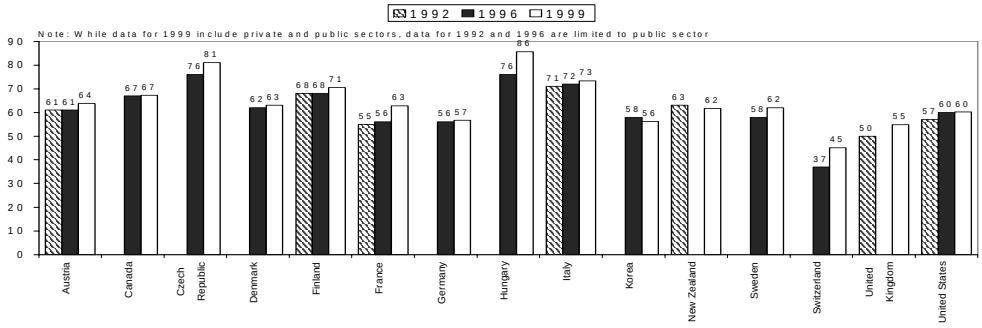
32. The time evolution of the gender composition of teaching workforces is depicted in figures 2.11 and 2.12. For the time span under consideration, while for some countries there is evidence of growing proportions of female teachers (for example, Austria, Finland, France, Ireland, Italy), for others no clear trend for additional feminisation exists (for example, Germany, New Zealand, Spain, United States). However, it is clear that in no countries is the proportion of women in the profession decreasing.

Figure 2.11: Percent of Women among Teaching Staff, Time Trends, Primary Level of Education



Source: OECD Education Database.

Figure 2.12: Percent of Women among Teaching Staff, Time Trends, Lower Secondary Level of Education



Source: OECD Education Database.

33. The overall gender imbalance in the profession translates into what many educators consider an inadequate presence of male role models. This is compounded by the fact that recruitment practices are limited in their scope, perpetuating the predominant presence of women.

2.3. Adjustment Mechanisms: How are Supply and Demand brought into line?

34. In this section, the focus is on the mechanisms that bring supply and demand for teachers into line. The main objective is to understand how educational systems respond to imbalances between demand and supply namely when demand exceeds the available supply of qualified teachers. This analysis helps understanding what are the implications of teacher shortages for the quality of the educational system.

35. In the short run, school systems facing situations of excess demand can respond in a variety of ways. The typical strategies used are:

- *Relaxing qualification requirements during hiring (Supply side):* If a qualified applicant is not available to fill an open teaching position, a less qualified applicant will typically be hired. Many teachers are hired on emergency certificates (out-of-license teaching) while others are experienced teachers with poor performance records. Another solution consists of

requiring teachers to teach outside their areas of certification: teachers trained in another field or grade level are assigned to teach in the understaffed area (out-of-field teaching).

- *Raising teaching loads (Demand Side):* The demand for teachers can be reduced and brought into line with available supply by increasing the workloads of employed teachers. This can be achieved both by increasing class sizes and by increasing the average number of classes assigned to teachers. Both approaches increase the pupil-teacher ratio.

36. Hence, in the short term, school systems adjust to excess demand situations either by relaxing qualification requirements or by increasing teachers' workloads. Most importantly, in either case, quality suffers.

37. Alternatively, in situations where demand exceeds supply, it might be expected that a significant proportion of teaching positions would remain unfilled. Yet that is rarely the case. Hiring practices ensure that teachers are present to staff almost all classrooms. In this way, the immediate effect of a shortage is more likely to be a lower quality of teachers and teaching than a dramatic tale of classrooms full of uninstructed pupils. In fact, there may be no observed quantity imbalance but instead a change in the quality characteristics of the teaching workforce.

38. In the long run, systems have a wide range of strategies for enhancing the supply of teachers. The most common is to raise salaries substantially so as to make the profession more competitive with other occupations. However, as described in detail in chapter 4 (section 4.3), additional strategies are available to educational authorities, namely working conditions, the status of the profession, the career ladder, or merit-based incentives. In particular, initiatives such as bonuses offered to teachers in shortage teaching fields, or shortage locations, can be used as a short-run strategy.

39. In sum, in the short term, it is through adjustments in quality that supply and demand come into equilibrium. In the long term, adjustments in salaries and working conditions determine equilibrium.

2.4. Teacher Shortages

40. In recent years an increasing number of studies have expressed concern about current and prospective teacher shortages in many countries. Some studies claim that severe shortages currently exist and there is a gap between the quality of current teachers and the quality needed to ensure effective instruction. In this way, teacher shortages have become a major source of concern for educational authorities and are being addressed continuously by policy makers.

41. In what follows, the meaning of shortage is provided together with an explanation for why it is so difficult to find an agreed measure for it. Current trends that might explain the crisis in teacher supply are then described. Finally, a short overview of policy activity seeking to deal with shortages is provided.

2.4.1. Definition and Measurement

42. As briefly described in section 2.3, a teacher shortage is more likely to indicate an inadequate distribution of teacher quality than to mean that there are insufficient numbers of teachers to staff courses. In fact, a quantitative shortage – fewer teachers than there are classes to be taught – will not be observed except in those cases in which a course or class is cancelled because a teacher cannot be found with the appropriate credentials.

43. It is then not surprising that there is no clear, universally agreed measure of what actually constitutes a shortage in relation to a given number of teaching posts.

44. According to Wilson and Pearson (1993), two potential measures can be considered:

- *Vacancy Rates:* The simplest measure is the number of unfilled vacancies for teachers. Despite its appeal, such measure is likely not to be reliable. Very few vacancies cannot be filled in some way (teachers with emergency certification, temporary staff). As seen before, schools tend to relax teaching requirements and hire less qualified teachers if they have trouble filling in a position. Second, it is possible that some schools might not create vacancies for staff if they are convinced that a particular post will not be filled by a teacher with the appropriate skills and abilities. What is of greater interest is the number of "difficult to fill" vacancies, those which have been "unfilled" for a significant period of time, or the proportion of positions filled by teachers with "emergency certification".

- *Hidden Shortages:* Hidden shortages are said to exist when teaching is carried out by someone who is not qualified to teach the subject. It is often referred to as "out-of-field" teaching and is usually measured as the proportion of teachers teaching a subject in which they are not qualified.

45. It is then the case that shortages are difficult to measure, especially because shortages are more a "quality" than a "quantity" issue.

46. Another aspect is that problems of supply are uneven. In some regions, subject areas, or grade levels, shortages can be particularly acute. For example, shortages tend to be more intense in certain subject matters such as science and mathematics, in teaching fields such as special education, and in rural areas.

2.4.2. Current Trends

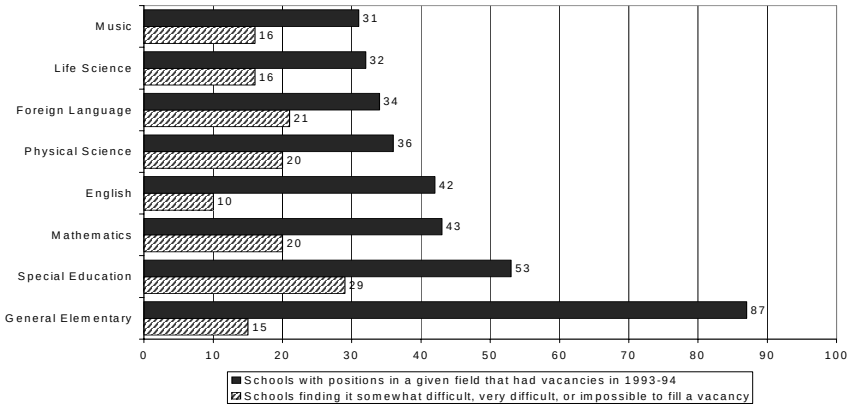
Assessing the severity of teacher shortages

47. As mentioned earlier, shortages are difficult to measure. Indicators for the gravity of shortages include the proportion of "difficult to fill" vacancies, proportion of "unfilled" positions, proportion of teachers with "emergency certification", and the proportion of teachers teaching "out-of-field". Unfortunately, data of this kind are not readily available.

48. In particular, data of this type are not available at the OECD level. In what follows, as an illustration of the aspects that shortages can take, data available for the United States are provided.

49. Figure 2.13 provides information about the "difficulty in filling positions" in schools of the United States for the 1993-94 academic year. It tells us that difficulties depend on teaching field and are more serious in areas such as Foreign Languages, Physical Science, or Special Education. Overall, it also shows that in a considerable number of cases, schools have had difficulties in filling in positions.

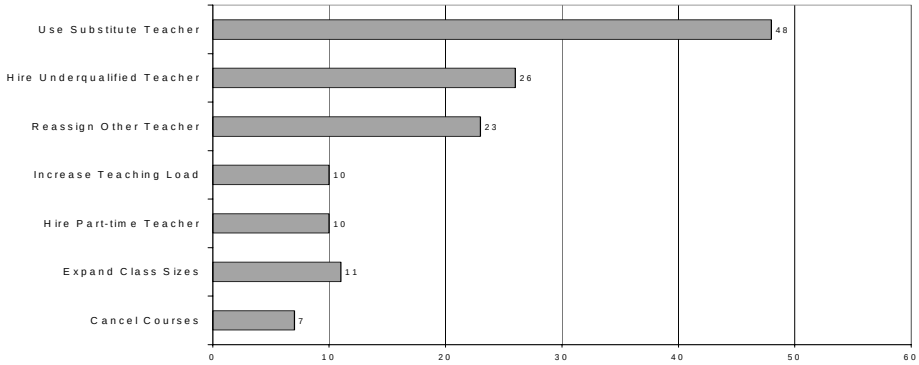
Figure 2.13: Difficulty in Filling Teaching Positions, United States, 1993-94, (Percent of Schools with Teaching Vacancies, by field, and percent that found them difficult to fill)



Source: U.S. Department of Education (1997).

50. Figure 2.14 illustrates what strategies schools use when they have difficulties filling in positions. It provides us information about the relative importance of the several adjustment mechanisms described earlier. It is clear that, for any of the strategies used, the quality of teaching is likely to decline. In 1993-94, only 4 percent of all new openings remained unfilled or vacant.

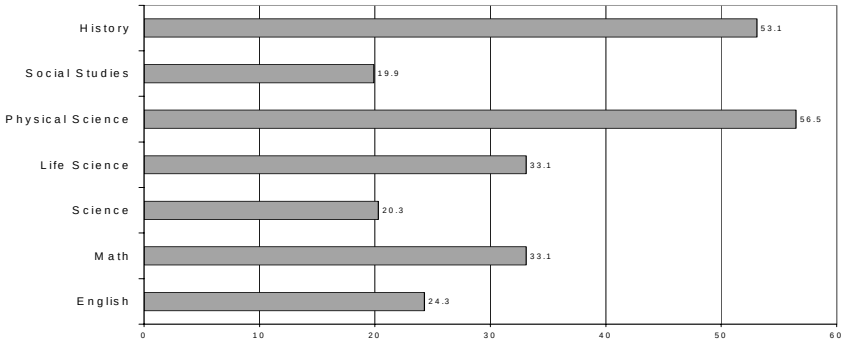
Figure 2.14: Of Schools with difficulties filling teaching vacancies, percentage using various methods to cover their vacancies, 1993-94, United States



Source: Figure reproduced from Ingersoll (1999).

51. Figure 2.15 provides information about another dimension on which teacher shortages have an impact: “out-of-field” teaching. The statistics provided are quite impressive and illustrate the severity of the problem. For instance, in the United States for the 1993-94 school year, for grades 7-12, 56.5 percent of Physical Science teachers did not have neither a major nor a minor in that field. The same happened for one third of mathematics teachers. As described in Ingersoll (1999), teacher shortages provide a partial explanation for this phenomenon.

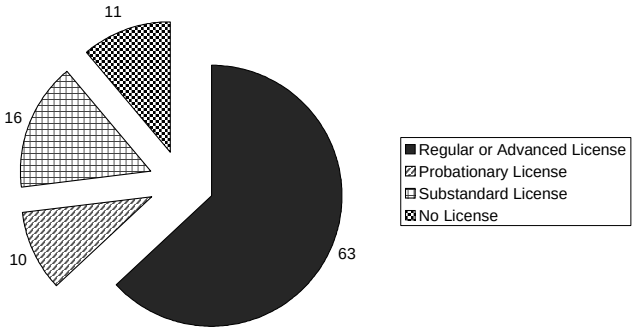
Figure 2.15: Percentage of Secondary School (Grades 7-12) Teachers in Each Field Without a Major or a Minor in that Field, 1993-94, United States



Source: Data collected from Ingersoll (1999).

52. Finally, figure 2.16 provides information on the "license status" of teachers for the 1993-94 academic year. It reveals that more than one third of teachers in the United States did not have a regular license for teaching.

Figure 2.16: License Status of Newly Hired Public School Teachers, 1993-94, United States



Source: Tabulations conducted by Richard Ingersoll from data contained in the NCES's Schools and Staffing Survey 1993-94.

53. It would certainly be useful to have data with this level of detail for all OECD countries, as it would greatly help to assess how serious teacher shortages effectively are in the different countries.

Potential Explanations for shortages

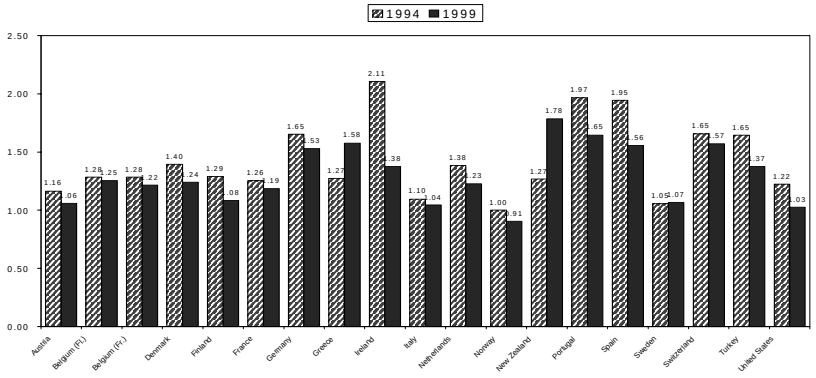
54. Teacher shortages seem to be associated with a set of trends that reduce supply and increase demand. The most commonly cited trends, which affect OECD countries differently, are:

- *Decline of the overall attractiveness of the teaching career relative to other careers:* This decline is closely associated with the decline of teachers' salaries relative to those of other occupations. An imperfect measure to assess the seriousness of this decline is to look at how

the ratio of teacher salaries to GDP per capita evolved in the recent past. Figures 2.17 and 2.18 show such evolution for the period 1994-99, for primary and lower secondary teachers, respectively.

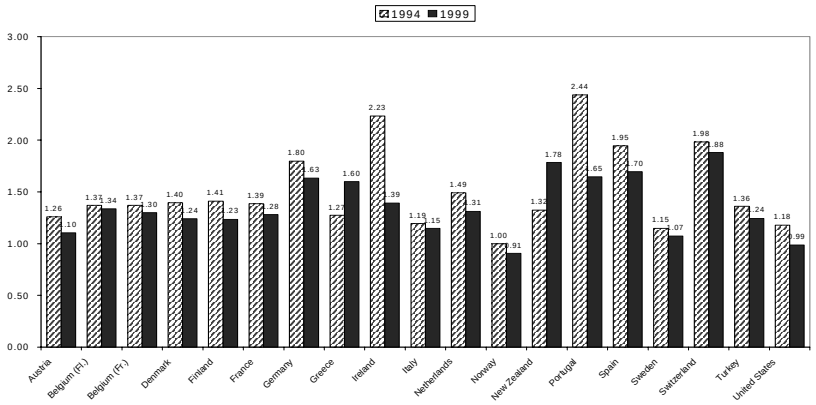
The trend is clear. For all countries, except Greece and New Zealand, the salaries of teachers relative to GDP per capita have declined. In some cases such as Ireland, Portugal, and Spain, such decline was very significant. Therefore, it can be concluded that the attractiveness of the profession, as far as the salary dimension is concerned, has declined substantially in the most recent years.

Figure 2.17: Ratio of salary after 15 years of experience to GDP per capita, Public Institutions, Primary Level of Education



Source: OECD Education Database.

Figure 2.18: Ratio of salary after 15 years of experience to GDP per capita, Public Institutions, Lower Secondary Education



Source: OECD Education Database.

In figure 2.19, salaries of primary teachers are compared to those of other public sector employees, for 1996. It is then possible to assess the attractiveness of primary teaching compared to other activities within the public sector.

Figure 2.19: Comparison of average primary teachers' salaries with those of other public sector employees (1996)

Average compensation of employees for selected occupations in the public sector

Comparison with a primary teacher's salary

0 Between -10 and +10 per cent of a primary teacher's salary
- More than 10 but less than 30 per cent lower than a primary teacher's salary
-- More than 30 per cent lower than a primary teacher's salary
+ More than 10 but less than 30 per cent higher than a primary teacher's salary
++ More than 30 per cent higher than a primary teacher's salary

	Draughtsman	Pre-primary teacher	Computer operator	Nurse	Social worker	Executive official I[1]	Mathematics teacher in secondary education	Sanitary engineer	Civil engineer	Executive official II[1]	Head teacher	Public health physician
Australia	++	-	-	o	o	o	+	++	++	++	++	++
Austria	-	-	-	+	o	o	++	++	++	++	++	
Canada	+	o	o	++	++	++		++	++	++	+	++
Czech Republic	-	-	--	o	++	o	+	+	++	+	+	++
Denmark	o	o	o	o	o	++	++	++	+	++	++	++
France	+	o	+	o	+	o	+	++	++	++	++	++
Germany	-	-	-	-	-	+	+	+	+	+	+	+
Greece	-	o	-	o	-	-	o		-	-	+	++
Hungary		-		-		o	+			++	++	
Iceland		-	+	+	+	o	++	++	++	+	++	++
Ireland	-		--	+	+	-	o	o	++	+	++	++
Israel	o	o	o	-	o	++	+	++	++	++	++	++
Italy	o	o	o	+	+	+	o	++	++	++	++	++
Japan	++	o	-	o		++	o	o	++	++	++	o
Luxembourg	-	o	-	-	+	o	++	++	++	+	++	++
Mexico	--	-	-	-	-	++	+			++	++	o
Netherlands	o	-	-	-	+	+	+	++	++	+	++	++
Norway		o	o	o		+	+	++	++	+	++	++
Poland				-			o					++
Portugal	--	o	o	o	++	--	o	++	++	--	o	++
Slovak Republic	+	-	o	-	o	+	o	++	++	+	++	+
Spain	-	o	-	o	-	-	+	++	++	+	++	++
Sweden	-	-	-	o	o	-	+	o	o	+	++	++
Switzerland	--	-	-	-	-	o	+	+	+	o	++	++
Turkey	-	o	-	+	++	-	o	+	+	-	++	+
United Kingdom	-	o	-			-	+	o	o	o	++	
United States	-		--	o	+		o	++	++			++

1. Unlike Executive Official I, Executive Official II does not require a Tertiary-type A qualification and sometimes works to an Executive Official II.

Source : EUROSTAT-OECD Purchasing Power Parities Programme (1996). Occupations are classified according to ISCO-88 (Categories 1 to 3).

Source : OECD - Education at a Glance 2001.

Aspects other than salaries affect the attractiveness of the profession. It is likely that factors such as working conditions also deteriorated in the recent past. However, data are not available to confirm such trend but it is often stated that teachers have seen the status of the profession substantially lowered. It thus seems that some policy action is urgently needed to make the profession more attractive so that serious teacher shortages do not materialise.

An important phenomenon, often mentioned as one of the factors leading to shortages, is the fact that women increasingly find new careers open to them and no longer enter education in the same numbers. This was especially true of bright, capable women who had formerly provided public school systems with a low-cost pool of talented teachers. They now find improved job opportunities in fields outside of education.

- *Increasing teacher retirement rates due to ageing teaching workforces*: Another factor explaining the development of teacher shortages is associated with increasing retirement rates. As described in section 2.2, many countries face aged and ageing teaching workforces. As a result, teacher retirement rates have increased and are expected to keep increasing in the years to come, making teacher shortages problems more acute. This trend is naturally associated with the attractiveness of the profession as it reveals that younger people are not entering the profession in enough numbers. However, as it will be seen below, retirement

might still not be the main reason leading teachers to leave the profession indicating that retention might be the main issue to be addressed by policy makers.

- *Public schools systems grew as a consequence of "baby booms" or higher enrolment rates:* In a few countries, another explanation for teacher shortages involves the demand side. On the one hand, student enrolments have increased in some countries as the result of "baby booms". On the other hand, enrolment rates in practically all countries have increased. Data on school-age population and enrolment rates can be found in chapter 3.

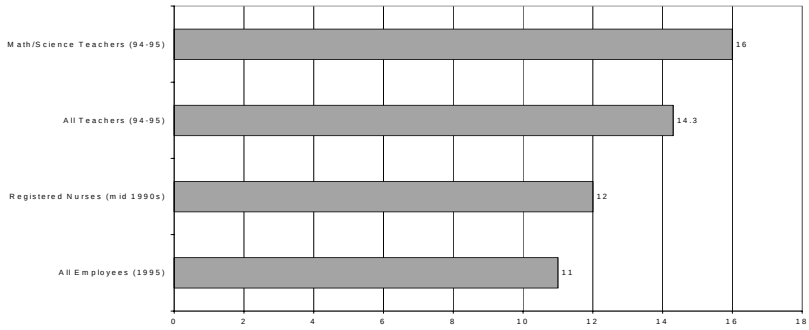
- *Decline in student-teacher ratios*: Another possible explanation involves student-teacher ratios. In some countries, such as the United States, student-teacher ratios have declined, especially for lower grades. Data on student-teacher ratios can be found in chapter 3.

Levels of Turnover

55. An important measure in characterising problems associated with teacher supply is the level of turnover in the profession. Data on teacher turnover is again typically not available. Once again, the focus is on data from the United States.

56. In figure 2.20, levels of turnover for teachers are compared with the levels of turnover for registered nurses and levels of turnover for all employees. It is revealed that teaching has a relatively high turnover rate. According to Ingersoll (2000), in 1994-95 over 417,000 teachers, from a force of about 3 million, departed their teaching jobs. An additional relevant information is that total teacher turnover is evenly split between migration and attrition: 7 percent of teacher turnover were movers and 7.3 percent left the occupation altogether. Not surprisingly, turnover rates for math/science teachers are higher than for other teachers.

Figure 2.20: Levels of Turnover per type of activity in the United States



Source: Figure reproduced from Ingersoll (2000).

57. According to Ingersoll (2000), these high rates of turnover account for most of the new demand for teachers which, in turn, is a driving force behind school staffing problems. The data show that the demand for new teachers is not primarily due to increasing student enrolments.

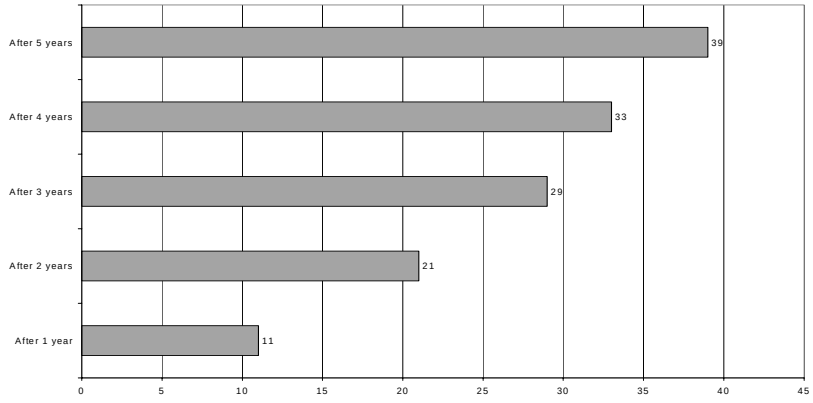
Characteristics of leavers

58. Over the past two decades there has been substantial empirical research focused on determining which kinds of teachers are more prone to leave teaching and why (for example, Grissmer & Kirby, 1987;

Murnane et al., 1991; Murnane, Singer, & Willett, 1988). This research shows teacher turnover is strongly correlated with the individual characteristics of teachers. Among the most important findings has been that teacher turnover is strongly affected by academic field. Although the data have been inconsistent at times, special education, mathematics, and science are typically found to be the fields of highest turnover.

59. Another important finding is the U-shaped relationship between age/experience and teacher retention. In the early years, attrition rates are high – either because many entering teachers find that the occupation is not what they had thought, have adverse experiences that result in withdrawal from the teaching force, or find more attractive employment opportunities. At the other end of the spectrum, where the older and more experienced teachers are located, attrition rates rise as retirement approaches. Figure 2.21 illustrates this trend.

Figure 2.21: Beginning Teacher Attrition: Cumulative percent teachers having left teaching occupation, by years of experience, United States, 1994-95



Source: Figure reproduced from Ingersoll (2000).

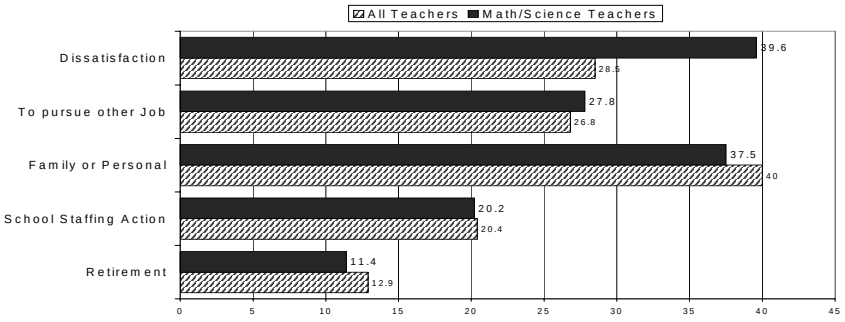
Reasons for turnover

60. Another information of interest is the set of reasons leading teachers to leave their current teaching position. For example, such information would help us understanding whether retirement accounts for a significant fraction of teacher turnover.

61. Ingersoll (2000) provides an analysis on this issue for the case of the United States. In figure 2.22, the relative importance of specific reasons for teacher turnover is depicted. Reasons were grouped into five categories:

- School Staffing Action: reduction-in-force; lay-off; school closing; reassignment.
- Dissatisfaction: dissatisfied with teaching as a career; dissatisfied with the school; for better salary or benefits.
- Personal: family or personal move; pregnancy/child rearing; health; other family or personal reason.
- To pursue other Job: to pursue another career; to take courses to improve career opportunities in or outside the field of education; for better teaching job.
- Retirement.

Figure 2.22: Reasons for turnover according to teachers (Percent), 1994-95, United States

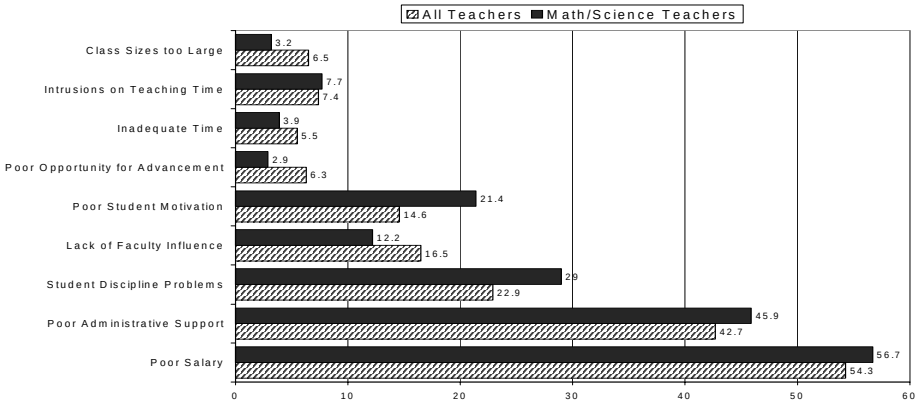


Source: Figure reproduced from Ingersoll (2000).

62. The data reveal that retirement is not the predominant factor behind teacher turnover. Other causes such as teacher job dissatisfaction and teachers pursuing better jobs or other careers are significant factors explaining teacher turnover. It suggests that school-staffing problems are primarily due to excess demand resulting from a "revolving door" where large numbers of teachers depart their jobs for reasons other than retirement.

63. Figure 2.23 provides additional information on reasons for dissatisfaction-related turnover. The data show that, in particular, low salaries, inadequate support from the school administration, student discipline problems, and limited faculty input into school decision-making all contribute to higher rates of turnover, after controlling for the characteristics of both teachers and schools.

Figure 2.23: Reasons for dissatisfaction-related turnover given by teachers (Percent), 1994-95, United States



Source: Figure Reproduced from Ingersoll (2000).

64. This analysis suggests that popular education initiatives, such as teacher recruitment programmes, will not solve the staffing problems of schools if they do not address the issue of low teacher retention. Consequently, besides the development of recruitment-oriented policies, retention should be the target of ambitious educational policies.

2.4.3. Policy Activity to Deal with Shortages

65. In light of teacher shortages, governments started developing a whole host of initiatives and programmes designed to recruit new and talented candidates into teaching. Most of these initiatives seek to address the problems of teacher shortages in the short run without introducing major educational reforms leading to significant improvements in the status of the profession.

66. In what follows, a sampling of policy initiatives seeking to deal with teacher shortages is provided. These initiatives involve essentially monetary incentives, improved working conditions and professional support for teachers. The examples provided are based on the experience of the United States, New Zealand, and United Kingdom.

Programmes involving monetary incentives

67. Some of the characteristics of such programmes are:

- *Signing bonuses:* Used in Massachusetts, Iowa, Delaware, and New York in amounts of up to $20,000. In New Zealand, a *Beginning Teacher Time Allowance* has been created in 1997.

- *Merit-based payments and career-structure-oriented policies:* In the United Kingdom, the government has created a new second pay range for high performing teachers. In addition, a new national fast-track system has been established to attract graduates and move outstanding teachers quickly through the profession.

- *Additional pay in areas of subject shortage, such as Mathematics and Science:* The Department of Education and Skills from the United Kingdom has created a hardship fund for those in subjects where teacher shortages exist. However, such fund is fairly small when compared to the ones associated with policy initiatives such as the "Golden Hellos" and training bursaries (see below).

- *Free rent, Housing subsidies, and reduced mortgage rates*

- *Income tax credits*

- *Scholarships, bursaries, and forgivable loans*

  In the United Kingdom, a full waiver of tuition fees for all postgraduate certificate in education students and £6,000 bursaries are already available. "Golden Hellos" of £4,000 are also available for those who train in one of the shortage subjects (mathematics, science, modern foreign languages, English including drama, and technology) and who then go on to complete induction and secure a relevant post teaching that subject.

  In New Zealand, to encourage future teachers of subjects in short supply to train for the profession, the Ministry of Education awards scholarships.

  In the United States, the *Teaching Service Cancellation/Deferment Options* provided by the federal government allow for the deferment and/or cancellation of federal loans if an individual becomes a full time teacher serving in a low-income or subject matter shortage area. Most states also have some form of scholarships or loan forgiveness programmes for prospective educators.

- *Expanded benefit programmes, such as childcare*: In New Zealand, salary credit for time spent child-rearing counts as experience in determining salary for returning teachers.

- *Removal of pension disincentive for teachers reaching retirement age:* In the United Kingdom, the government launched a programme to encourage returners by removing pension disincentive. Retired teachers are now able to return full-time for 6 months of half-time for a year without loss of retirement pension. Government-funded refresher courses are also available. This strategy is also being developed by several states in the United States.

- *Relocation allowances:* New Zealand created a *Limited Relocation Grant* for all teachers recruited from within the country to any designated "priority staffing" school. Recruitment allowances are also available to schools employing a teacher who must relocate from within New Zealand. In addition, teachers moving to a long term position in a school with a staff incentive allowance are eligible for a full or partial reimbursement of their transfer and removal costs.

Programmes involving improved working conditions

- Efforts to create safe and healthy schools, class size reductions

Programmes involving training/professional support for teachers

- *Systematic induction and mentoring programmes:* In the United Kingdom, the *Teacher Training Agency* prepares materials to help trainee teachers in the use of ICT in their teaching of particular subjects.

- *Provision of ongoing professional development opportunities:* For example, in New Zealand, since 1996 the Colleges of Education were contracted to run retraining programmes for primary teachers to update them on the latest curriculum and teaching methodology developments. All teachers who graduate from an official retraining programme are eligible for a "Beginning Teacher Time Allowance". In addition, schools are entitled to grants for onsite relief teacher orientation/retraining programmes.

- *Alternative certification programmes:* In this context, college graduates can postpone formal education training, obtain an emergency teaching certificate, and begin teaching immediately.

  For example, in the United Kingdom, employment-based teacher training programmes for career-changers have been created. Similarly, to attract employed individuals who may wish to remain in their existing jobs, new modular courses have been developed for post-graduate teacher training. In the same way, in New Zealand, job-sharing options are available for teachers wanting to enter of re-enter the permanent workforce on a part-time basis.

  Peace Corps–like programs, such as *Teach for America* in the United States, which are designed to lure the "best and brightest" into understaffed schools fall into this category. *Teach for America* recruits recent college graduates from all academic majors to commit to teaching for two years in an understaffed urban or rural school. In addition a programme such as *Troops to Teachers* seeks to give retired and/or downsized military personnel an entrance into a second career in public education.

Complementary Initiatives

68. Initiatives such as advertising complement the main set of policies. For example, in New Zealand, the government developed an extensive multimedia advertising campaign to encourage former teachers back into the profession and attract graduates to the service (*TeachNZ* advertising campaign).

69. In the United Kingdom, a network of advisors co-ordinate and energise recruitment activities in areas with shortages.

70. In the United States, in most states, web sites were developed on which teacher job openings are posted.

International Competition for Teachers

71. As a consequence of teacher shortages, an interesting phenomenon has emerged in the teaching profession: international competition for teachers. This phenomenon is particularly developed among English-speaking countries such as Australia, New Zealand, United Kingdom, United States, and Canada. In what follows, a description of New Zealand's initiatives in this context is provided.

- Relocation Grants: In New Zealand, from 1st January 1997, all overseas teachers recruited for more than 20 weeks are eligible for a *Limited Relocation Grant*.

- Immigration Waivers: In order to facilitate easy entry into New Zealand for highly qualified, suitable teachers, the Ministry of Immigration has waived the requirement whereby teachers must be offshore before applying for long term work permits. In addition to this, job offers are considered as evidence of a case made, making local labour market checks unnecessary.

- Recognition of overseas teaching experience: All overseas teachers appointed to a school have their full overseas teaching service credited towards their New Zealand salary.

  New Zealand trained teachers who have spent time teaching overseas are entitled to full service credit when appointed to any New Zealand school.

- Beginning Teacher Time Allowance: In New Zealand, all overseas year one teachers are entitled to a full Beginning Teacher Time Allowance.

- Official Approval of agencies recruiting overseas teachers: New Zealand has approved a process by which recruitment agencies for overseas teachers may acquire official status.

3. DEMAND FOR TEACHERS

3.1. Introduction

72. This chapter deals with the demand for teachers. On the one hand, it seeks to provide a detailed description of what determines the demand for teachers. Such description, developed in section 3.2, is complemented with a simple quantitative analysis based on the data available for OECD countries. In addition, this examination permits the identification of the main policy tools for educational authorities in the management of teacher demand. On the other hand, in section 3.3, this chapter aims at providing a detailed description of the current empirical evidence, as pictured in the academic and policy literatures, on the effects of policy tools on educational outcomes. Such analysis, given the little research devoted to other less relevant policy tools, concentrates on the currently very intense class size policy debate. Finally, as a complement to this last section, a few examples of policy activity in the class size domain are provided.

3.2. Determinants of Demand for Teachers

73. The demand for public school teachers is defined in the aggregate as the total number of teaching positions open at a given time. Total demand thus defined is the end result of a number of factors leading to the establishment of teaching positions.

74. However, in order to understand the dynamics of demand for teachers and in designing policies to ensure an adequate supply of teachers, it is important to specify demand in greater detail, that is stratified by subject matter, grade level, region of country, and preparation for serving the special needs of students (for example, handicapped students and those with limited proficiency in the country's language). In addition, demand should preferably be specified by the attributes of teachers desired, especially teacher qualifications (training, degree level, licensure status, and experience).

75. The main factors determining teacher demand in any particular school year are the size of the school-age population, average class size, teaching load of teachers, enrolment and retention rates, ending age of compulsory education, required learning time for students, policies pertaining to curriculum, students' preferences over elective courses and over educational programmes and, in the specific case of teachers in public schools, parents' preferences between private and public schools.

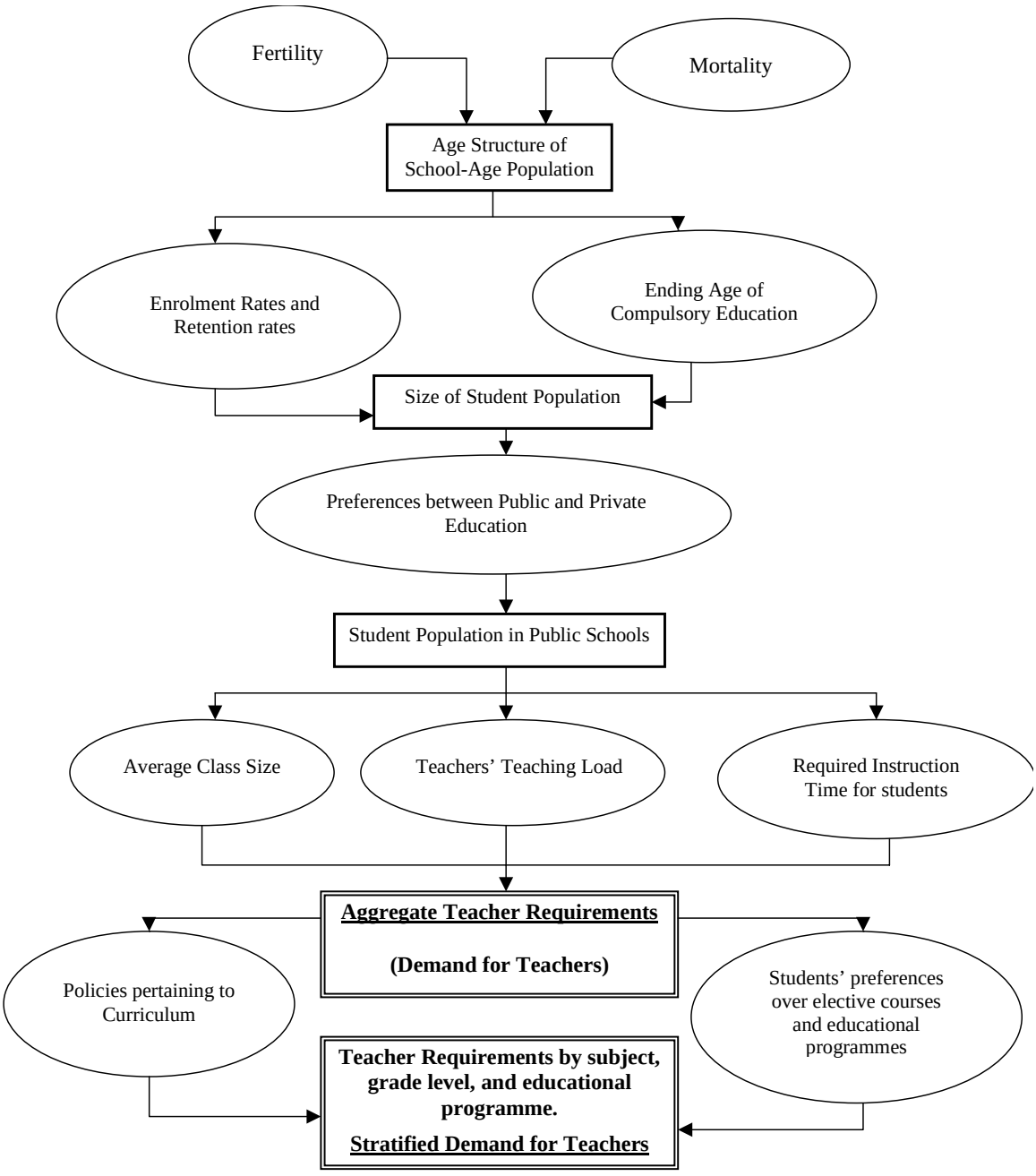
76. In a simplified way, ignoring that differences are observed at subject, educational programme, and grade levels, the relationship between these factors can be written in the following way:

$$Number\ of\ Teachers = \frac{Student\ Population}{Avg\ Class\ Size} \times \frac{Avg\ Nbr\ of\ \mathrm{Re}quired\ Learning\ Hours\ for\ Stud.}{Teachers'\ Teaching\ Load}$$

77. This equation ends up summarising what determines the demand for teachers ("Number of Teachers" in the equation above). However, it should be emphasised that it represents the "demand for the average teacher", ignoring the level of detail associated with subject area, grade level, or educational programme. The factor "Student Population", specific to public schools, is determined by the Age structure of the School-Age Population (section 3.2.1), Enrolment rates and retention rates (section 3.2.3), the Ending Age of Compulsory Education (section 3.2.4), and preferences between public and private education (section 3.2.8). The factors "Average Class Size" and "Teachers' Teaching Load" are directly addressed in section 3.2.2. In turn, the factor "Average Number of Required Learning Hours for Students"

is addressed in section 3.2.5. Finally, the detailed demand for teachers by subject area, grade level, and educational programme is determined by policies pertaining to curriculum (section 3.2.6) and students' preferences over elective courses or educational programmes (section 3.2.7). The links between these factors can be found in chart 2.

Chart 2 - The Determinants of the Demand for Teachers



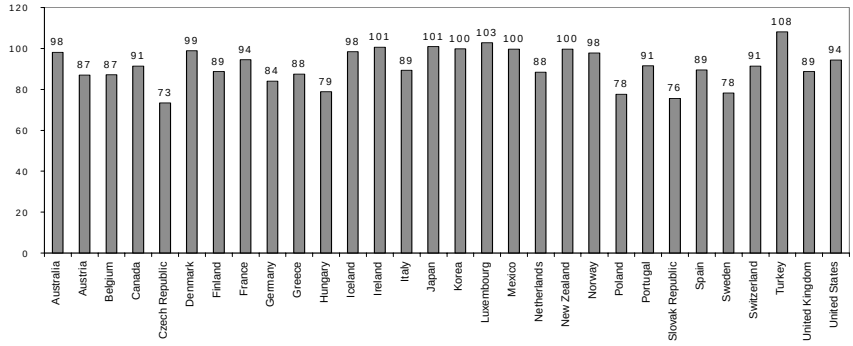
78. In what follows, a brief description of each of these factors is provided.

3.2.1. The Demographic factor: Size of the School-Age Population

79. Demand for teachers is determined to a great extent by the size of the school-age population. In fact, changes in the age structure of the population may have far-reaching effects on the requirements for teaching staff. For example, the North-American baby boom, which lasted from the mid-1940s to the early or mid-1960s, had massive effects on student enrolment. The wave of new students hit the elementary schools in the 1950s, rolled on, and into the high schools, and then eventually into the universities. The demand for teachers increased sharply and school systems were hard-pressed to staff their classrooms. Then, almost as abruptly as it had begun, the baby boom was over and was replaced by the baby bust of the 1960s and ensuing decades. The demand for teachers fell and a new set of problems presented itself: oversupply replaced shortages.

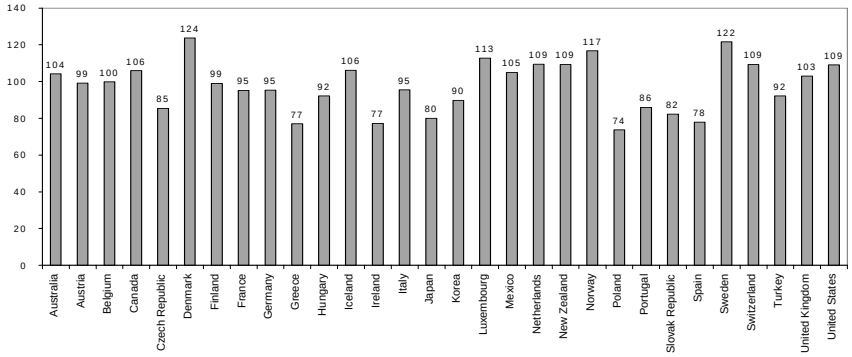
80. Figures 3.1 and 3.2 provide information on the expected changes of the school-aged population from 2000 to 2010 in several OECD countries for ages 5-14 and 15-19, respectively. For the 5-14 age range, there is a very marked trend indicating that this student population is expected to decrease in most countries (exceptions are Turkey, Luxembourg, Japan, and Ireland), in some countries in a significant way (Czech Republic, Hungary, Poland, Slovak Republic, and Sweden). For ages 15-19, the projections reveal more mixed results. Some countries are expected to have their student population for this age range reduced substantially (Greece, Ireland, Japan, Poland, Slovak Republic, and Spain) while others are expected to have it increased (Denmark, Luxembourg, The Netherlands, New Zealand, Norway, Sweden, Switzerland, and United States) in a somewhat marked way.

Figure 3.1: Expected Changes of the School-Age Population from 2000 to 2010 (2000=100), Ages 5-14



Source: OECD Education Database.

Figure 3.2: Expected Changes of the School-Age Population from 2000 to 2010 (2000=100), Ages 15-19



Source: OECD Education Database.

3.2.2. Teaching Technology: average class size and the teaching load

81. Another major determinant of demand for teachers is teaching technology, namely average class size and teachers' teaching loads. These two factors together with the average required number of learning hours per student define pupil-teacher ratios.[4] Rewriting the equation given in the beginning of this chapter, it is possible to relate pupil-teacher ratios to class size. The term on the left represents the pupil-teacher ratio.

$$\frac{Student\ Population}{Number\ of\ Teachers} = Avg\ Class\ Size \times \frac{Teachers'\ Teaching\ Load}{Avg\ Number\ of\ \text{Re}quired\ Learning\ Hours\ for\ Students}$$

82. Note that the ratio

$$\frac{Teachers'\ Teaching\ Load}{Avg\ Number\ of\ \text{Re}quired\ Learning\ Hours\ for\ Students}$$

corresponds to the average number of classes per teacher.

83. Typically, adjustments are made to teaching technology to smooth the effects of rapid enrolment changes, to accommodate established staffing patterns and budgets, and to take into account existing contractual agreements with teachers, in the case of enrolment declines.

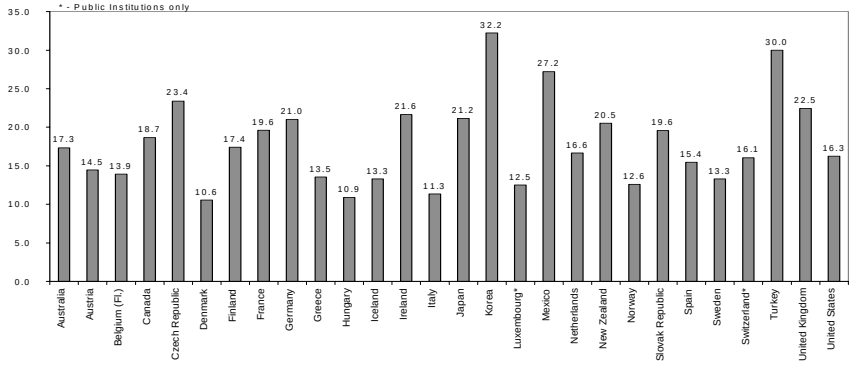
84. A small change either in average class sizes or on the average number of classes assigned to teachers can cause a significant change in the demand for teachers. Changes in pupil-teacher ratios can be

[4] It is important to realise that pupil-teacher ratios and class size are not equivalent. At the country level, two countries can have the same teacher-pupil ratios but very different class sizes because of variations in teaching loads, teaching assignments, the number of classes per student, and other factors. At the school level, the two indicators might differ for a variety of reasons including the provision of specialised instruction (as with special education), the use of teachers in supervisory and administrative roles, and the contractual classroom obligations of teachers.

caused by changes in school budgets, staffing patterns, class sizes, or teaching loads, for example. In particular, class sizes and teaching loads are policy tools often used by educational authorities.

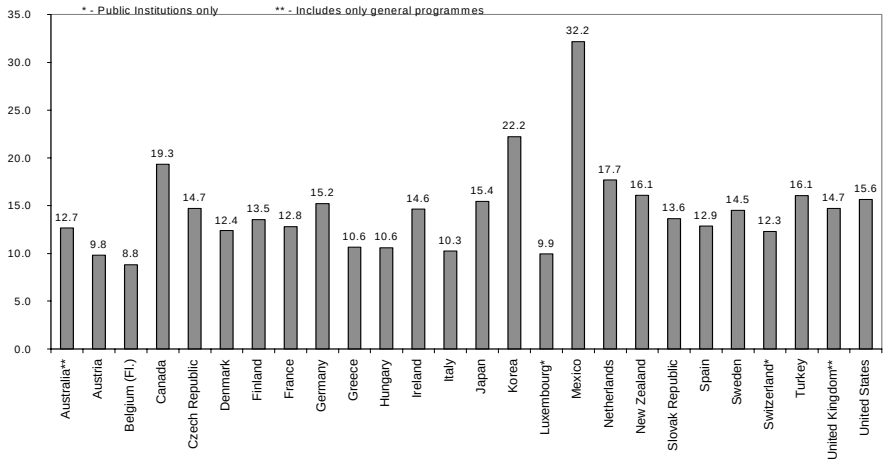
85. In figures 3.3 and 3.4, the ratio of students to teaching staff in 1999 is provided at the OECD level for primary education and secondary education, respectively. Considerable differences exist between countries: while Korea (primary education) and Mexico (secondary education) have ratios above 32, Austria and Belgium for secondary education have ratios below 10. In addition, the data suggest that pupil-teacher ratios tend to be lower in secondary education.

Figure 3.3: Ratio of Students to Teaching Staff, 1999, Primary Level of Education, Public and Private Institutions



Source: OECD Education Database.

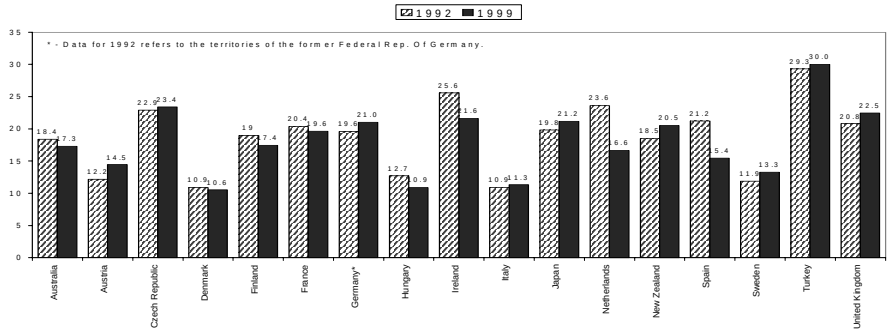
Figure 3.4: Ratio of Students to Teaching Staff, 1999, All Secondary Education, Public and Private Institutions



Source: OECD Education Database.

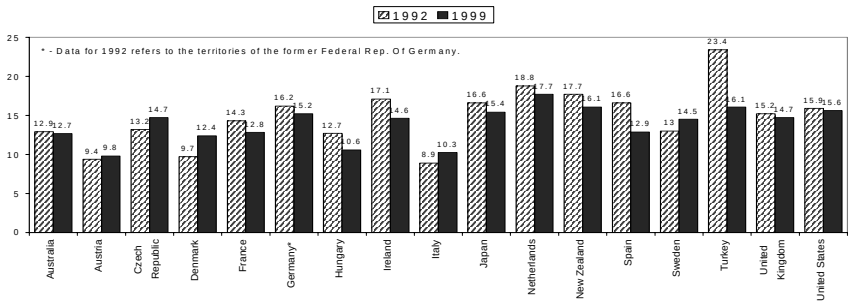
86. Figures 3.5 and 3.6 provide information on recent time trends for the ratio of students to teaching staff. No clear trend emerges even if the number of countries that reduced their pupil-teacher ratio is greater in secondary education. Ireland, The Netherlands, Spain, and Turkey seemed to have engaged in serious policies seeking to reduce their pupil-teacher ratio.

Figure 3.5: Ratio of Students to Teaching Staff, Time trends, Primary Level of Education, Public and Private Institutions



Source: OECD Education Database.

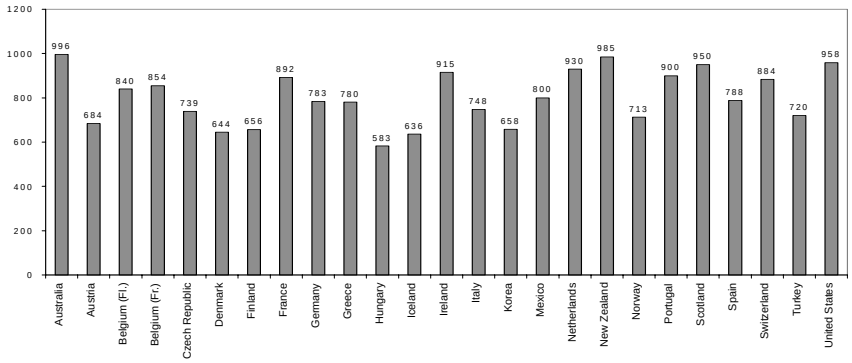
Figure 3.6: Ratio of Students to Teaching Staff, Time trends, All Secondary Education, Public and Private Institutions



Source: OECD Education Database.

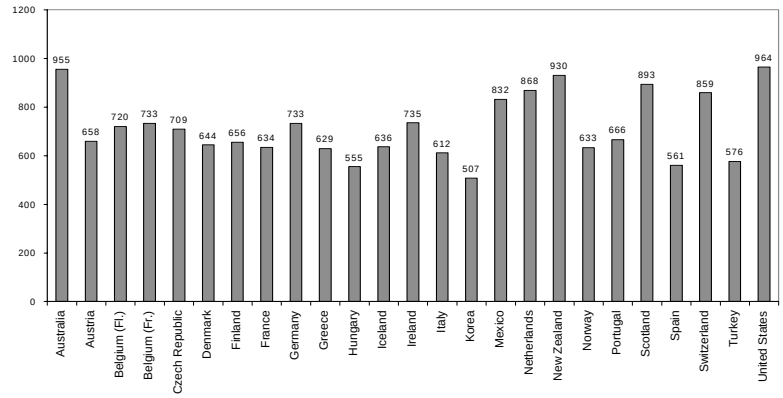
87. Figures 3.7 and 3.8 provide information regarding the number of teaching hours in public institutions in 1999. Again, significant differences between countries emerge. While the number of teaching hours is close to 1000 in countries such as Australia, The Netherlands, New Zealand, or United States, in other countries such as Austria, Denmark, Finland, Hungary, Korea, or Iceland that value is around 600.

Figure 3.7: Number of teaching hours per year in public institutions, 1999, Primary Level of Education



Source: OECD Education Database.

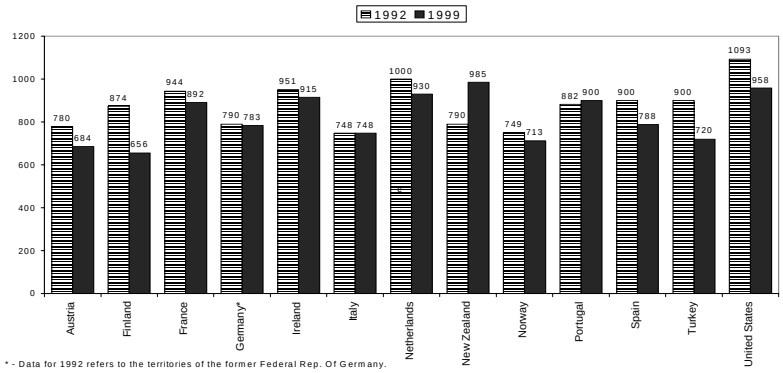
Figure 3.8: Number of teaching hours per year in public institutions, 1999, Lower Secondary Level of Education



Source: OECD Education Database.

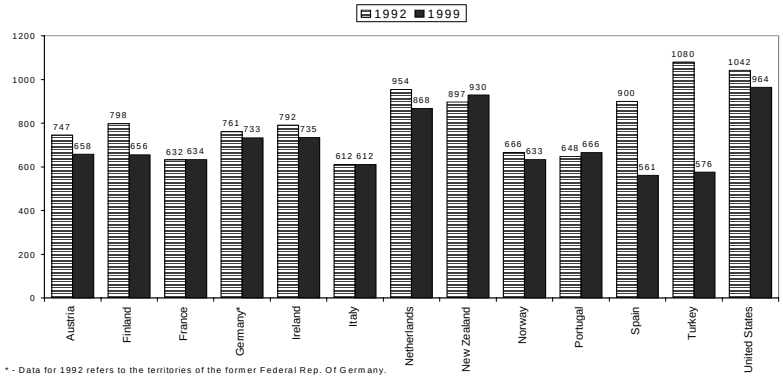
88. Finally, figures 3.9 and 3.10 show the recent evolution over time of the number of teaching hours in OECD countries. The trend is clear: in most countries, the number of teaching hours has decreased. This trend is particularly marked in countries such as Finland, The Netherlands, Spain and Turkey. The only countries for which the number of teaching hours increased are New Zealand and Portugal.

Figure 3.9: Number of teaching hours per year in public Institutions, Time Trends, Primary Level of Education



Source: OECD Education Database.

Figure 3.10: Number of teaching hours per year in public institutions, Time Trends, Lower Secondary Level of Education



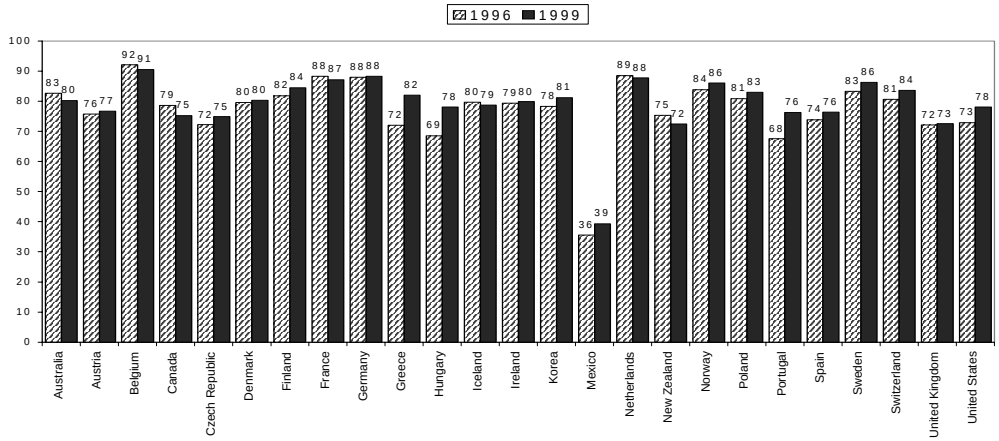
Source: OECD Education Database.

3.2.3. Enrolment and retention rates

89. Enrolment rates in the age-range for which education is not compulsory are another determinant of total enrolment levels and thus influence demand for teachers. This factor is affected by the level of educational returns to schooling as dictated by local labour market conditions.

90. In figure 3.11, enrolment rates for students aged 15 to 19 in OECD countries are shown. For most countries, enrolment rates are above 70 percent with the exception of Mexico. The trend has clearly been the increase in enrolment rates, most notably for Greece, Hungary, and Portugal.

Figure 3.11: Enrolment Rates: Students Aged 15 to 19 as a Percentage of the Population aged 15 to 19. Time Trends



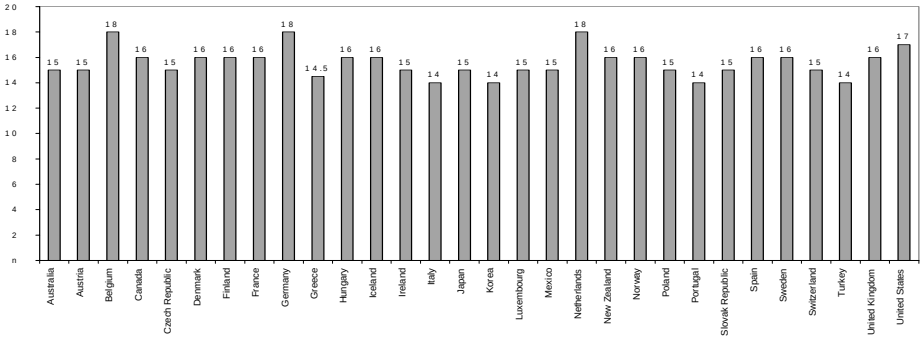
Source: OECD Education Database.

91. Another element influencing student enrolments for each grade level is the level of grade retention in each country. No data are available about such factor. Retention levels in each country depend on established academic standards that define requirements for passing from one grade level to the next.

3.2.4. Ending age of compulsory education

92. In the context of the determination of enrolment levels, another important element is the legal ending age of compulsory education. In figure 3.12, such legal age is given for OECD countries. Interestingly, 4 years of difference still exist between the countries in which such age is highest (18 years of age in Belgium, Germany, and The Netherlands) and the countries in which such age is the lowest (14 years of age in Italy, Korea, Portugal, and Turkey).

Figure 3.12: Ending Age of Compulsory Education, 1999



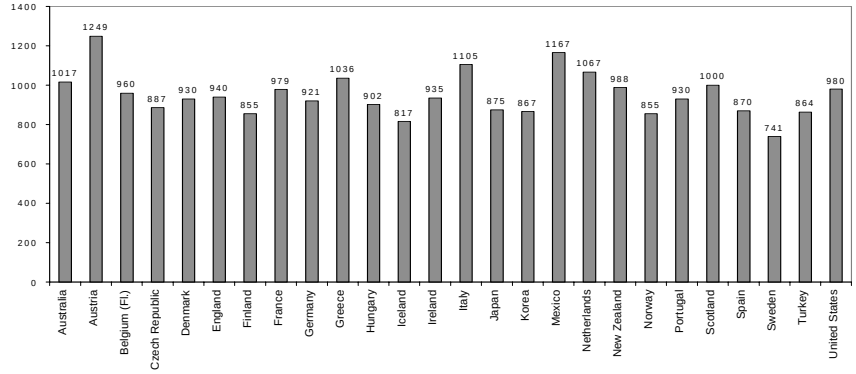
Source: OECD Education Database.

3.2.5. Required learning time for students

93. Another decision of educational authorities concerns the required time for learning activities for students. Such requirement is another component defining the needed amount of teaching services.

94. In figure 3.13, the intended instruction time for students aged 14 in several OECD countries for 1999 is shown. As expected, differences arise between countries, the range of values going from around 1250 hours per year in Austria to 741 hours in Sweden.

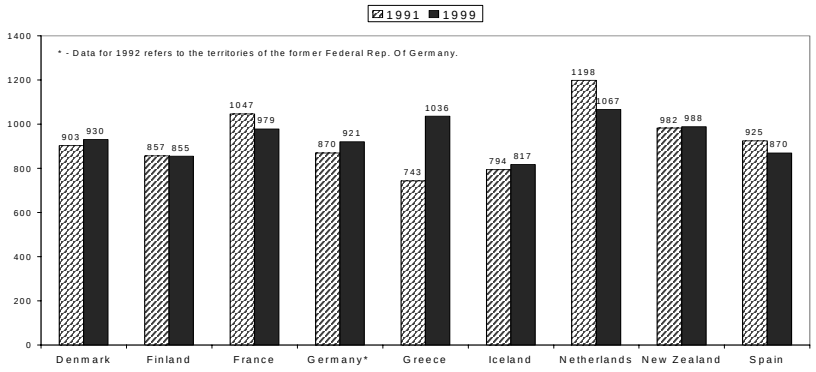
Figure 3.13: Intended Instruction Time in hours per year for students aged 14, 1999



Source: OECD Education Database.

95. In figure 3.14, the recent evolution over time in intended instruction time is shown for some countries. No clear trend emerges. Some countries (for example, The Netherlands, France) have lowered required learning time while others (for example, Greece) have raised it.

Figure 3.14: Intended Instruction Time in hours per year for students aged 14, Time Trends



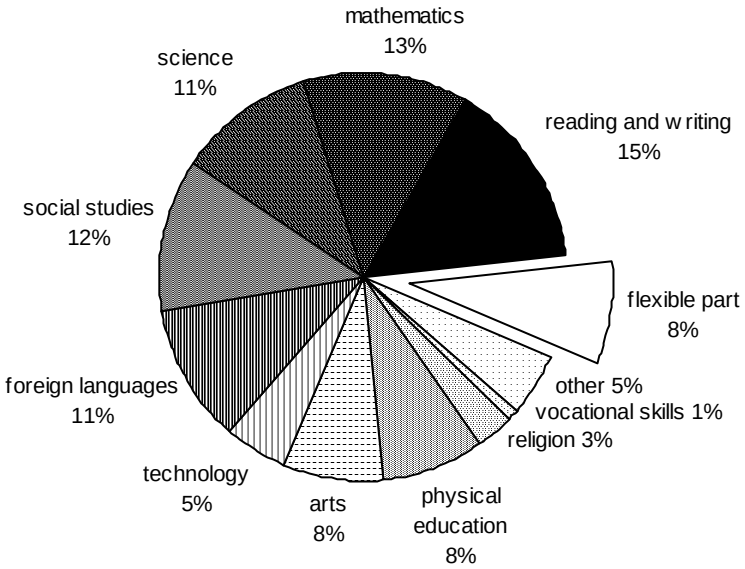
Source: OECD Education Database.

3.2.6. Policies pertaining to curriculum

96. The definition of the curriculum to be taught in schools has direct impact on the relative demand for teachers in specific subject fields. In fact, the relative amount of time to be spent in specific subjects defines the relative demand for teachers with a given specialisation. In addition, graduation requirements or even entrance requirements of colleges and universities define whether more course work is to be developed in given areas such as science or mathematics.

97. As an illustration, in figure 3.15, the mean intended instruction time per subject (age 12-14) for OECD countries is shown.

Figure 3.15: Intended instruction time per subject (age 12-14), 1998, Mean OECD



Source: Education at a Glance 2000.

3.2.7. Students' preferences over elective courses and educational programmes

98. As shown above, part of students' curriculum is flexible. In this way, students' preferences over elective courses also play a role in defining the type teachers that school systems need. Many factors can influence students' choices of courses, including high school graduation requirements, college entrance requirements, government support for science and mathematics education that motivates schools to encourage enrolment in these subjects, and fashions or tastes on the part of students, their parents, and peers for certain subjects.

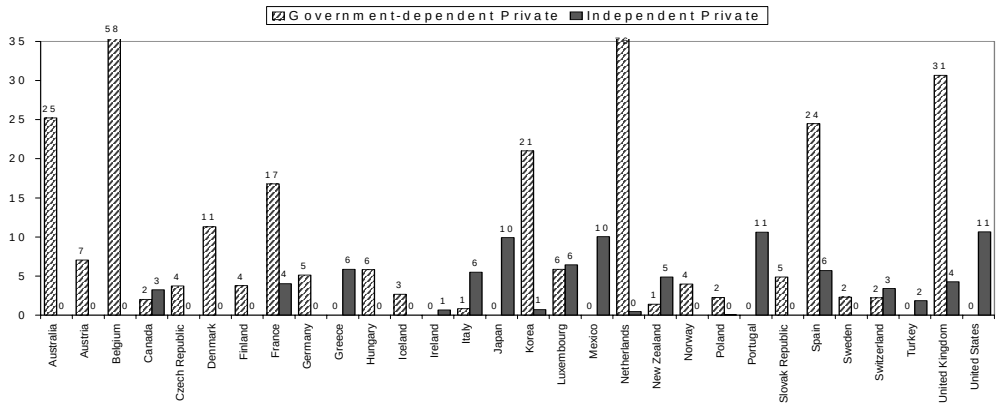
99. Along the same lines, the choice of students over educational programmes (for example, general versus vocational) is another channel through which students' preferences impact the demand for specific types of teachers.

3.2.8. Parents' preferences between public and private education

100. Finally, in assessing the demand for public school teachers, a major element is related to parents' preferences between public and private education. Changing preferences for private school enrolment can greatly impact pubic school demand.

101. In figure 3.16, for the OECD area, the percentage of primary and secondary students in non-public institutions for 1999 is given. Two types of non-public institutions are considered: government-dependent private and independent private institutions. These data suggest that independent private institutions have little weight in any of the countries considered. However, in countries such as Holland, Belgium, or United Kingdom, government-dependent private institutions are widely represented.

Figure 3.16: Percentage of Primary and Secondary Students in non-public Institutions, 1999



Source: OECD Education Database.

3.3. Policy Tools: The Class Size Debate

102. The description in section 3.2 reveals the policy tools that are available to educational authorities in the management of teacher demand. Such policy tools are:

- Class size
- Teaching loads

- Required learning time for students
- Structure of curriculum and educational programmes
- Ending age of compulsory education
- Academic standards defining requirements for graduation

103. The policy tool whose effects have been more deeply studied is class size. Very little research exists on the effects of teaching loads on both teacher satisfaction and student performance and on the effects of learning time on student achievement. On the other hand, the structure of the curriculum, the ending age of compulsory education, or academic standards are less likely to be used as policy tools in the management of teacher demand. For these reasons, the remainder of this section concentrates exclusively on the very intense class size debate.

3.3.1. Effects of Class Size on student achievement

104. Class size is among the most thoroughly researched topics in education. At the same time, class size reduction is probably one of the most popular and most funded school improvement policies. Yet, no definite agreement among researchers has been reached about the effects of class size on students' outcomes. Much of the research on the relationship between class size[5] and achievement is inconclusive. Even if the debate is markedly polarised, researchers converge in certain aspects of the discussion. These contain some useful guidance for educators and policy makers. In what follows, a detailed description of where the debate stands is provided

Expected Effects

Effects likely to lead to higher student achievement

105. A perception exists among parents and teachers that smaller classes are better than larger classes. Researchers and policy analysts, however, are more cautious.

106. The higher student achievement brought about by class size reduction may result from some of the ways in which reducing class size naturally alters the classroom environment. First, students can receive more individualised attention. The teachers know each of their students better, and can keep track of how each student is doing on the learning task of the moment. This knowledge enables the teacher to intervene more effectively to help the individual student make progress. Put differently, it can be argued that in smaller classes each student receives a larger portion of the educational resources represented by the teacher's instructional time, and consequently, learns more (Mitchell et al 1989).

107. Second, smaller classes are more likely to be "friendlier" places, where students develop better relationships with their classmates and with the teacher. There are fewer students to distract each other, the level of noise is reduced, there are fewer disruptions, encouraging students to become more engaged in classroom activities. In addition, class size reductions might also change the educational opportunities beyond the classroom, insofar as teachers have a larger portion of time to devote to working in out-of-class activities.

[5] In many studies reviewed in this section, pupil-teacher ratios are used as a proxy for class size.

Effects likely to lead to lower student achievement

108. All other things being equal, smaller classes are preferable to larger ones as a consequence of the effects just described. However, all things are seldom equal, and other factors, such as the quality of teaching can be affected as a consequence of reduction in class size.

109. The reduction in class sizes has other potential effects. First, because it requires the recruitment of more teachers it might reduce the quality of teaching workforces. In fact, sudden increases in demand for teachers may lead to the recruitment of many teachers without adequate training. Another effect might be the transfer of many experienced teachers from lower-income and disadvantaged communities to locations with more affluent and easier-to-teach students, taking advantage of sudden openings. In addition, schools might face problems of availability of classrooms, resorting to situations such as placing two teachers in a single classroom with forty students.

110. At the same time, there is strong evidence (Rivkin, Hanushek, and Kain, 2000) showing that teacher quality is one of the most important factors in student achievement. In this way, whether or not large-scale reductions in class sizes have a positive impact depends to a considerable extent on whether the new teachers are better or worse than the existing teachers.

111. In what follows, attention is devoted to the results of empirical studies which focus on the net effect of class size reductions on student achievement.

Net Effect of Class Size reductions on student achievement – The Empirical Evidence

112. Causal effects of class size on student achievement have proved very difficult to measure and the debate remains very polarised. The leading proponent of the view that broad policies to reduce class size are ineffective is Eric Hanushek. In a series of influential literature summaries (Hanushek, 1986, 1989, 1996a, 1996b, 1997, 1998a), Hanushek concludes that increased spending in general, and smaller class size in particular, do not "systematically" lead to improved student achievement. Hanushek reviewed hundreds of research studies that attempt to assess the relationship between various school resource inputs – including class size - and achievement. He draws his conclusion from the fact that, according to him, studies are almost equally likely to find negative effects of small class sizes on achievement as they are to find positive effects, and that a majority of the estimates in the literature are statistically insignificant.

113. Many researchers dispute Hanushek's conclusions. Alan Krueger (2000) points to the fact that Hanushek's results depend on the peculiar way in which he combines the many studies in the literature. Krueger suggests a different approach for combining the same studies[6] and concludes that the effect of resources on achievement is much more positive than Hanushek found. Along the same lines, Hedges, Laine, and Greenwald (1994) using a more sophisticated statistical analysis, combining estimates across studies in a way that takes account of the estimates' precision, reach a different conclusion than Hanushek, showing a systematic positive relationship between resource inputs and school outcomes. Krueger concludes that "in view of the large differences between Hanushek's results and the results of the reanalysis undertaken … in other meta-analyses, one should be reluctant to conclude that school resources are irrelevant to student outcomes."

114. Other several major analyses have used various analytical methods to draw conclusions through reviews of already existing research studies. Some studies report positive effects of class size reduction.

[6] Hanushek treats estimates within studies as the unit of analysis while Krueger treats each study as the unit of analysis.

Glass and Smith (1979), and Glass et al (1982) published an analysis combining results of numerous empirical studies assessing the relationship between class size and achievement. Overall, they found that small classes were associated with higher achievement at all grade levels, especially where the number of students in the class was fewer than 20. Another study (Slavin 1989) found that reduced class size had a small positive effect on student that did not persist after their reduced class experience. In turn, Robinson and Wittebols (1986) concluded that the clearest evidence of positive effects is in the primary grades, particularly kindergarten through third grade, and that reducing class size is especially promising for disadvantaged students.

115. Supporting Hanushek's views, other research analyses have concluded that class size reduction does not have an appreciable effect. Tomlinson (1988) examined trend data from the 1950s to 1986 in the United States and did not find any consistent relationship between class size and standardised test scores. In the same way, Odden (1990) reviewed the existing research and argued that a system-wide class reduction policy would produce only modest gains in student achievement and incur an unjustifiably high cost.[7]

116. Each study about the impact of class size on students' achievement is subject to criticism due to possible mis-specifications, inadequate data sets, and most importantly, its non-experimental[8] nature leading to the inadequate identification of class size effects. As Hoxby (2000c) points out, "the vast majority of variation in class size is the result of choices made by parents, school providers, or courts or legislatures. Thus, most of the observed variation in class size is correlated with other determinants of student achievement and is likely to produce biased results."

117. Researchers believe that conducting true randomised field experiments is the only valid method for resolving disputes of this kind. In this context, the major experiment in reduced class sizes – Tennessee's Project STAR (Student/Teacher Achievement Ratio Study) – has had great impact on this policy debate. According to Harvard statistician Frederick Mosteller (1995), Project STAR "is one of the most important educational investigations ever carried out and illustrates the kind and magnitude of research needed in the field of education to strengthen schools."

118. Studies based on the STAR experiment (Finn and Achilles 1990, Krueger 1999) find that class size has a significant effect on test scores, especially for disadvantaged children. According to Krueger (2000), "the careful design of the STAR experiment makes these results more persuasive than the rest of the literature on class size". However, as Rothstein (2000) points out, even if the Tennessee results are entirely reliable, policy makers should be careful in drawing conclusions that go beyond what the Tennessee results can support. In fact, these results are specific to the characteristics of Tennessee's school system for degrees of class reduction similar to the ones carried out in this experiment (classes of 16 and 24 students).

119. Hanushek is considerably less optimistic about the evidence provided by the STAR experiment. In a recent study (Hanushek, 1999), Hanushek indicates potential important design and implementation issues "which suggest considerable uncertainty about the magnitude of any treatment effect". He concludes that "ignoring consideration of uncertainties and possible biases in the experiment, the results show effects

[7] Other interesting surveys on class size are Hanushek (1996c), Card and Krueger (1996), Betts (1995), and Burtless (1996).

[8] If treatment and control groups (respectively the group of students in smaller classes and the group of students in classes of regular size) are not randomly selected from large enough populations, it is possible that their relevant characteristics (whatever they may be) are not equally distributed between the two groups. This implies that differences in student achievement cannot be explained solely on the basis of class size since variation in the relevant characteristics might also explain such differences.

that are limited to very large (and expensive) reductions in kindergarten or possibly first grade class sizes. No support for smaller reductions in class size (above 13-17 students) or for reductions in later grades is found in the STAR results."

120. Hoxby (2000c) recognises that evidence based on project STAR has manifest advantages. However, she points out some important disadvantages. Most importantly, the actors in the experiment are aware of it. As Hoxby describes "… the schools in a class experiment may realise that if the experiment fails to show that the policy is effective, the policy will never be broadly enacted. In such cases, the schools have incentives that the fully enacted policy would not give. That is, the experiment alters incentive conditions… in addition, some individuals temporarily increase their productivity when they are being evaluated. Finally, individuals sometimes try to undo the randomness of the experiment. For instance, some administrators may try to fill the small classes with children who are most in need of individual attention. Other administrators may assign their best teachers to the small classes or monitor the small classes more."

121. In an attempt to avoid the disadvantages of explicit experiments, Hoxby (2000c) uses population variation – credibly exogenous - in the school-aged population to identify the effects of class size on student achievement. The method has the advantage that random variation in the population generates exogenous variation in class size. Her results indicate that that class size does not have a statistically significant effect on student achievement. She also finds no evidence that class size reductions are more efficacious in schools that contain high concentrations of low-income students. According to the author, the approach has three main advantages. First, the variation in class size is credibly exogenous. Second, the actors in the natural experiment were not aware of being evaluated. Third, the natural population variation generates fluctuations in class size that are in the range relevant to current policy.

122. In the same way, Angrist and Lavy (1999) use an identification strategy based on a specific rule defining the maximum size of classes in Israel. Taking advantage of the fact that this rule provides an unusually credible source of exogenous variation for class size research, they reach results that strongly indicate that reducing class size induces a significant and substantial increase in test scores for fourth and fifth graders, although not for third grades. However, as the authors point out this rule is not the only source of variation in Israeli class size.

123. Thus, as Rothstein (2000) concludes "these two controversial lines of research – Hanushek's conclusion that there is no systematic relationship between resources and achievement, and the STAR results that smaller classes do make a difference – while not entirely inconsistent, are contending for public influence".

International cross-section analysis

124. Hanushek's (1998a) analysis suggests that international comparisons fail to show any significant improvements from having smaller pupil-teacher ratios. When combined with data on student performance (based on TIMSS, the Third International Mathematics and Science Study), the wide discrepancies in pupil-teacher ratios show little relationship to achievement. However there is not much confidence that such differences are more than statistical artefacts. As Hanushek states "Of course, there are many differences in the schooling and societies of the sampled nations (17), so it would be inappropriate to make too much of these results. They do, however, underscore further that the normal presumptions about the achievement effects of pupil-teacher ratios and class size are not found in the evidence." For instance, Asian countries whose students routinely outperform most OECD countries' students have class sizes of 30-40 students.

Where do opinions converge?

125. Despite the existence of a polarised debate over the effects of class size on students' achievement, antagonists tend to agree in issues of extreme relevance. On the one hand, considering both the facts that class size reductions are beneficial in specific circumstances and that broad reductions are very expensive, there is a strong consensus around the idea that class reductions should be targeted at those that benefit the most. In fact, school arrangements that reduce class size only for particular students, grades or subjects may achieve greater results with lower costs. It may be more important to reduce class size for reading than for physical education, and the research suggests that lower-income and disadvantaged students benefit most from smaller classes.

126. On the other hand, researchers and policy makers increasingly agree that the effectiveness of investments in class reduction policies should be compared to the effectiveness of other investments potentially leading to higher student achievement. The policy issue is not defined exclusively by whether we should expect positive effects from reducing class sizes. Even if we were confident of positive effects, the case for general policies to reduce class size would not yet be made. Consideration has to be given to other potential investments in quality. In this context, the development of a framework for the cost-benefit analysis of school spending would be extremely valuable.

127. As Krueger (2000) puts it: "Reducing class sizes is expensive, and it is reasonable to ask whether the benefits justify the costs. Most of the literature on class size reduction tests whether one can statistically reject the hypothesis of zero effect on performance. But for the most purposes a zero effect is not a meaningful null hypothesis to test. A more appropriate question is, *How big an improvement in student performance is necessary to justify the cost?*"

128. In this context, Hanushek (2000) summarises the current status of the debate in the following way: "The issue of course is not whether there exists any evidence that class size reduction ever matters. Surely class size reductions are beneficial in specific circumstances – for specific groups of students, subject matters, and teachers. The policy debates, driven by the politics of the situation, do not, however, attempt to identify any such specific situations but instead advocate broad reductions in class sizes across all schools, subjects, and often grades. The missing elements are three. First, nothing in the current decision process encourages targeting class size reductions to situations where they are effective. Second, class size reductions necessarily involve hiring more teachers, and teacher quality is much more important than class size in affecting student outcomes. Third, class size reduction is very expensive, and little or no consideration is given to alternative and more productive uses of those resources."

129. Krueger (2000) agrees that reductions in class sizes should be targeted at those that benefit the most: "The effect sizes found in the STAR experiment and much of the literature are greater for minority and disadvantaged students than for other students. Although the critical effect size differs across groups with different average earnings, economic considerations suggest that resources would be optimally allocated if they were targeted toward those who benefit the most from smaller classes".

130. In this context, Krueger (2000) proposes a framework for the cost-benefit analysis of school spending. He applies the findings of the Tennessee STAR experiment to his own previous research on the effect of school spending on the subsequent earnings of adults, and to similar research conducted with British data. From assumptions about future interest rates, Krueger estimates the long-term economic effects in greater income from class size reduction, and concludes that the benefits can be substantial exceeding the costs. Hanushek challenges Krueger's study by noting that Krueger's approach is based on strong assumptions and that estimates rely solely on evidence of labour market experiences of young Britons in the 1980s. Moreover he criticises the fact that Krueger takes the perspective that the proper comparison is between doing nothing and undertaking large reductions in class size.

The importance of teacher quality for the class size policy debate

131. Rivkin, Hanushek, and Kain (2000) develop a detailed study where they try to disentangle the separate factors influencing achievement with special attention given to the role of teacher differences and other aspects of schools. They conclude that while schools are seen to have powerful effects on achievement differences, these effects appear to derive most importantly from variations in teacher quality. It identifies a positive effect of smaller class sizes for low income children in earlier grades but these effects are very small relative to the effects of overall teacher quality differences. The authors conclude that variations among teachers dominate school quality differences.

132. In light of this evidence, recognising the importance of teacher quality is central to the discussion of class size. As any substantial reductions in class size imply hiring additional teachers, the success or failure of a class size reduction programme will depend not only on the impact of class size reduction per se but also on how the quality of the teachers is affected.[9] Furthermore, programmes seeking to improve the quality of teachers could produce major impacts on student performance that might be unachievable with any realistic class size reductions.

133. As Hanushek (1998b) refers "Unfortunately, class size reduction proposals usually are not accompanied by plans to recruit qualified teachers, and the current organization of schools and incentives to hire and retain teachers do little to ensure that the teacher force will improve. Reducing class sizes may likely have a negative effect by increasing the quantity of teachers at a time when what we need most is to increase teacher quality."

Why are class size reduction policies so popular?

134. Many policy makers emphasise the fact that class size reduction looks much more like a political issue about hiring teachers than a student achievement issue. They point out to the fact that class size reductions offer the hope of improving schools while requiring little changes in the existing structure.

135. As Hoxby (2000c) asserts "Class size reductions are enacted often because they are popular with nearly every constituency interested in schools. Parents like smaller classes because their personal experience suggests that they themselves give more to each child when they have fewer children to handle. Smaller classes give teachers the opportunity to practice more of each parent's favoured educational method. Teachers, teachers' unions, and administrators like smaller classes for the same reasons parents do, but they may also like smaller classes for reasons that spring from self-interest. Teachers may like smaller classes because they reduce the effort that they must expend in order to deliver instruction. Teachers' unions may like class size reductions because they increase the demand for teachers. Administrators may like class size reductions because they increase the size of their domain."

136. Hanushek (2000) agrees by saying "Politicians can take credit for pursuing identifiable policies aimed at improving student outcomes. Teachers and other school personnel see added resources coming into schools without pressures to take responsibility for student performance and see these policies increasing the demand for teachers."

[9] For instance, when California implemented its large-scale class reduction in 1996, it had to hire thousands of new teachers to the extent that 31 per cent of them were hired with only emergency credentials. In addition, a disproportionate fraction of these worked in urban districts.

137. It is then the case that, even if broad class size reduction policies are still not convincingly sustained by the existing empirical evidence, almost every constituency seems to have an interest in their implementation.

Conclusions and the role of incentives

138. Hanushek (2000) summarises the discussion around the merits of class size reductions in a very explicit way: "Despite the political popularity of overall class size reduction, the scientific support of such policies is weak to non-existent. The existence of evidence suggests that any effects of overall class size reduction policies will be small and very expensive. A number of investigations appear to show some effect of class size on achievement for specific groups or circumstances, but the estimated effects are invariably small and insufficient to support any broad reduction policies… Class size reduction is best thought of as a political decision. Past evidence suggests that it is a very effective mechanism for gaining voter support, even if past evidence also suggests that it is a very ineffective educational policy."

139. Hoxby (2000c) follows the same reasoning: "… class sizes can fulfil a variety of objectives, not all of which are related to achievement. Thus, while class size reduction always affords opportunities for increased investment in each child's learning, it is not obvious that every school takes up such opportunities. The actual effect of reducing class size will depend on the incentives a school faces."

140. Hanushek (2000) emphasises the role of incentives: "A major difference in policies aimed at class size reduction and those aimed at changing teacher quality is their relationship to incentives in schools. There is ample reason to believe that the current incentives related to student performance are too weak (Hanushek et al. 1994). Essentially nobody within schools has much riding on whether or not students achieve at a high level. The expected pay and career of a good teacher is about the same as that of a bad teacher. Class size reduction does nothing to change this."

The relevant questions

141. Hence, in the context of the class size debate, the relevant questions would be:

- Does reducing class size improve students' education?
- Will hiring more teachers in order to reduce class size exhaust the supply of qualified teachers?
- How big an improvement in student performance is necessary to justify the cost?
- How do investments in class reduction compare to investments in programmes affecting teacher quality?
- Should class reductions be targeted at those that benefit the most? If so, what are the situations in which class reductions seem to be more efficient?
- Should teachers hired to teach in smaller classes be prepared differently?

3.3.2. Effects of Class Size on teacher job satisfaction

142. This issue is discussed to some extent in the previous section. The general opinion indicates that teachers prefer smaller classes for a variety of reasons. They are able to give more to each pupil when they have fewer pupils to handle. Similarly, they have more flexibility to implement more favourable teaching methods. In addition, they may also like them because they reduce the effort they must exert while delivering the instruction. At the same time, it also increases employment opportunities.

143. In this way, reductions in class size are likely to lessen the problem of teacher attrition. If teachers find teaching in smaller classes more rewarding, they may stay in the profession longer, decreasing the frequency of the need to hire and train new teachers. However, there are no studies providing information about how strong this effect might be.

3.4. Policy Activity in Class Size Reduction

144. In what follows, a few initiatives taken in the United States are described together with some considerations on their effectiveness.[10] Other countries, such as France, have taken similar initiatives. However, time restrictions did not permit any analysis of policy activity in countries other than the United States.

145. **Tennessee's Project STAR** (Student/Teacher Achievement Ratio), as emphasised previously, has permitted important contributions to the quality of research about the effects of reductions in class sizes.

146. STAR was a 4-year longitudinal study of kindergarten, first-, second-, and third-grade classrooms in Tennessee, which began in 1985. STAR compared classes of 13-17 students with classes of 22-26 students both with and without an additional instructional aide in the larger classes. Participating teachers did not receive any professional training focusing on teaching in reduced size classes. Some of its characteristics were:

- Study size: Project STAR included 79 schools, more than 300 classrooms and 7,000 students.
- Random assignment: Teachers and students were randomly assigned to the three different kinds of classes in order to ensure that the study was not biased by who was in which type of class.
- In-school design: All participating schools implemented at least one of each of the three types of classes in order to cancel out the possible influences coming from variations in the quality of the participating schools that might affect the quality of the classroom activity.

147. The effectiveness of project STAR was described previously.

148. **Indiana's *Prime Time* Project** – In 1984 Indiana's *Prime Time* project allocated money to support the reduction of class size to 18 in first-, second-, and then kindergarten and third-grade classrooms. According to Pritchard (1999), implementation of *Prime Time* was not rigorously controlled, and the results were mixed. Tests of student achievement found that for students in smaller classes, the reading scores for first-graders showed the greatest improvement, with smaller gains in mathematics (Mueller at al 1988).

[10] This section is based on Pritchard (1999).

149. **Burke County Pilot-test, North Carolina** – Beginning in 1990, Burke County pilot-tested and then phased in a class size reduction project in the county school district. In 1995-96, 1,193 first-graders and 1,125 second-graders participated in the initiative. The programme's goal was to reduce class size to 15 students in all first-, second-, and third-grade classes. The Burke County project also included professional development activities covering instruction and assessment, and so the effects are not necessarily simply a function of reducing class size. Evaluation of the initiative has produced the following findings:

- Compared to a matched group of students in classes that had not been phased into the smaller class initiative, students in the smaller classes outperformed the comparison group in first, second, and third grades on both reading and mathematics achievement tests.

- Based on independent observations of classroom activity, the percentage of classroom time devoted to instruction in the smaller classes increased from 80 percent to 86 percent compared to the larger classes (Egelson et al 1996).

150. **California Class Size Reduction Programme** – In the 1996-97 school year, California began its Class Size Reduction Programme, through which it is giving money to school districts for the purpose of reducing the student/teacher ratio to 20 to 1 in kindergarten through third grade. It dedicated one billion dollars per year to this very broad programme. In the 1997-98 school year, 1.9 million children were assigned to smaller classes in California schools. California schools districts hired 18,000 new teachers in 1996, and almost one quarter of them had no teaching credentials. Districts also have had to use various means to create sufficient classroom space.

151. **Wisconsin's *SAGE* Programme** – Beginning in 1996-97, Wisconsin began a class size reduction programme called *the Student Achievement Guarantee in Education* (*SAGE*) Programme. The *SAGE* Programme's objective is to phase in class size reduction in kindergarten through third grade in school districts serving students from low-income families to a student/teacher ratio of 15 to 1 or less.

152. *SAGE* and comparison school students' academic learning was measured at the beginning and end of the first-grade year and again at the end of the second-grade year. The students' scores were compared to those of students in matching comparison schools serving similar populations of students, with the following results (Molnar et al 1998):

- SAGE first-grade students performed consistently better than comparison students in mathematics, reading, language arts, and total scores for the Comprehensive Test of Basic Skills.

- The achievement gap lessened between white and African-American students in the SAGE smaller classes in the first grade, in contrast to a widening of the gap between white and African-American students in the larger classes of the comparison schools.

- Second-grade SAGE students' academic achievement remained higher than that of the comparison school second-graders, but the difference did not increase substantially.

153. **Other State Initiatives** – In 1984, Texas passed legislation requiring class size to be limited to 22 students in kindergarten through 4th grade. Nevada began a class size reduction in 1990-91, beginning with a target of a 15 to 1 student/teacher ratio for kindergarten and 1st grade. In 1995, Virginia began to reduce class size in kindergarten through 3rd-grade classes for at-risk students, using a strategy in which local systems that devote funds to the voluntary programme may receive matching funds from the state.

4. SUPPLY OF TEACHERS

4.1. Introduction

154. This chapter concentrates on the supply of teaching services. The primary purpose is the identification of the main factors that shape the attractiveness of the profession. It is known that the number of teachers in a given field willing to work in a given location depends on a number of incentives, including the availability of teaching positions, salaries, opportunity cost salaries, working conditions, license procedures, or the status of the profession. This chapter reviews the academic and policy literatures on the importance of each of the main determinants of the supply of teaching services. Before pursuing such investigation, the main sources of supply of teachers are outlined and the set of decisions bringing individuals into the classrooms is described.

4.2. Sources of Supply and Set of Relevant Decisions

4.2.1. Sources of Supply

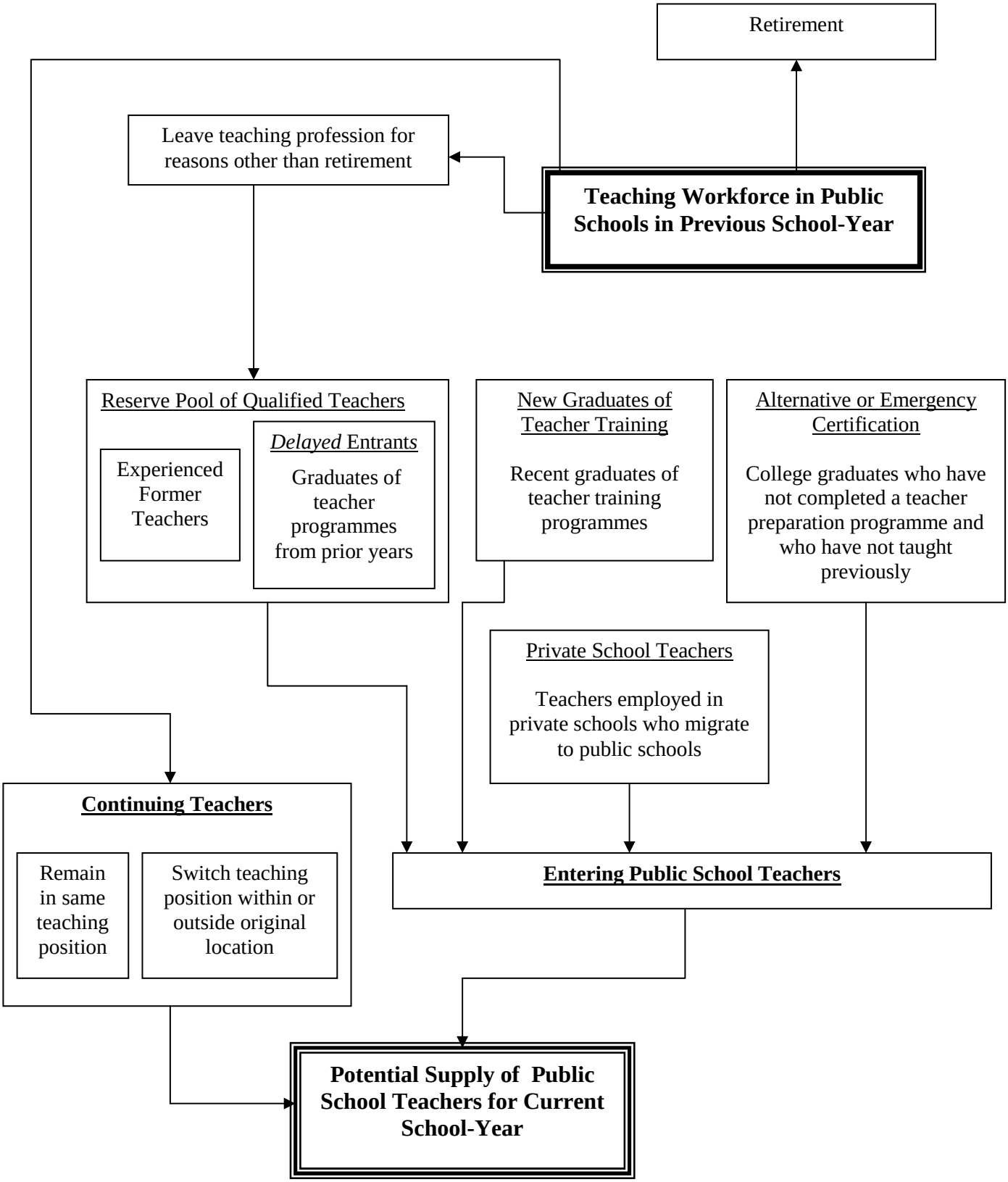
155. The supply of public school teachers in a given year is defined, in the aggregate, as the number of eligible individuals available from all sources willing to supply their services under prevailing conditions. Such conditions include salaries, other benefits, working conditions, other alternative career opportunities, teaching career structure, or personal circumstances.

156. In chart 3 the components of supply are described in some detail. The most important element of teacher supply during a given year is the retention of people returning from the prior year. The other main element corresponds to new entrants.

157. Continuing teachers typically have the option of remaining in the same position from one year to the next. Nonetheless, many teachers choose to apply for teaching positions in other schools within the same region, in other subject matter fields, or in a different region. Thus, the flows of practising teachers within the public education system constitute a major source of teachers hired into, or reassigned to, open teaching positions.

158. A large number of new individuals are also hired by the public system each year. Such entering teachers are drawn from four sources. The largest one corresponds to the so-called *reserve pool*. This group is composed of experienced former teachers and past graduates of teacher preparation programmes who did not enter teaching when they graduated but could be attracted to teaching careers with the right incentives. The second source consists of recent graduates of teacher preparation programmes. A third group consists of individuals who obtain alternative of emergency certification. These are college graduates who have not completed a teacher preparation programme and who have not previously taught. They are sometimes referred to as entrants via alternate routes. In most regions virtually any college graduate, with or without certification or experience, can be counted in the potential supply of new entrants. Certification is obtained on the basis of intensive training or apprentice teaching programmes, and hiring is carried out on an emergency certification basis. Finally, the last source of new entrants in public school systems are teachers employed in private schools who might wish to migrate to the public system.

Chart 3 - Potential Supply of Teachers, Flows in and out of the Profession



159. Teacher supply can be examined in terms of retention rates for the present stock of teachers, the flow of newly certified teachers from colleges and universities, the flow of returning teachers and graduates of teacher programmes who have been absent from the teachers labour market, the flow into the profession of individuals not holding a regular license, and the flow of private school teachers into the public system.

4.2.2. Sequence of relevant decisions

160. The set of decisions involved in the process of becoming part of the teaching workforce is the following:

- **Whether to train to become a teacher:** This decision is more likely to be affected by the availability of teaching positions, the supply of teaching programmes, specific incentives to acquire training in teaching (subsidisation of teacher training programmes), relative salaries of teachers, status of the profession, and requirements for obtaining a teacher license.

- **Whether to become a teacher:** This decision is more likely to be affected by the availability of teaching positions, relative salaries of teachers and opportunities outside teaching, status of the profession, or career structure. For those without regular teacher training, it also depends on alternative certification programmes.

- **Whether to switch teaching location:** This decision is more likely to be affected by the relative availability of teaching positions, relative salaries, and especially relative working conditions (namely the ones associated with safety and composition of the student body).

- **How long to stay in teaching:** This decision is more likely to be affected by relative salaries of teachers and opportunities outside teaching, status of the profession, career structure, merit-based incentives rewarding productivity, retirement benefits, and to a great extent personal circumstances such as the decision of raising a family.

- **Whether to return to teaching after a career interruption:** This decision is more likely to be affected by relative salaries of teachers and opportunities outside teaching, status of the profession, career structure, working conditions, and personal circumstances.

4.3. What incentives shape the attractiveness of the profession?

4.3.1.Introduction

161. This section considers the role of incentives in determining teacher supply. Understanding what determines the career decisions of teachers, former teachers, and potential teachers is essential for the efficiency of educational policy. It can lead to more effective policies aimed at reducing teacher attrition, especially of teachers in shortage areas.

162. This section summarises what is known in the empirical literature about the role that particular incentives play in the set of decisions that leads an individual to embrace a teaching career.

163. The reading of the empirical literature associated with the supply decisions of teachers identified the following set of factors as being the most relevant:

- Relative Salaries
- Career Structure
- Merit-based incentives
- Working conditions
- Teacher Professionalism – Status of the Profession
- Personal Circumstances
- Teacher Training and Certification
- Relative availability of positions

164. In what follows, the role of each of the above mentioned factors in the supply decisions of teachers is described. Results are presented with the following facts in mind:

- Responsiveness to incentives depends on personal characteristics of individuals (for example, gender, academic ability, subject area);
- Responsiveness to a specific type of incentive varies depending on which decision is being made (for example, decision on whether to enter teacher training versus decision on whether to come back to teaching after a career interruption).

4.3.2. Relative Salaries

165. Many policy makers advocate substantial salary increases as a means of attracting and retaining talented teachers in the school system and of encouraging harder work by current teachers. Salary policies are also often cited as important for offsetting changes in demands in competing occupations and for dealing with unattractive working conditions in particular sets of schools. Such proposals are premised on the belief that raising salaries will make teaching more attractive relative to other occupations and help alleviate current or potential shortages.

166. In this subsection, the impact of teacher relative salaries on the supply decisions of teachers is described. As could be expected, the empirical evidence strongly suggests that relative salaries have a strong impact on the decisions leading an individual to teach.

167. A series of influential studies employing data from Michigan and North Carolina (Murnane and Olsen, 1989, 1990) have demonstrated that teacher salaries are an important determinant of the length of time that teachers stay in teaching. In these studies, the authors analyse the impact of salaries and opportunity costs on how long teachers stay in teaching. The results indicate that teachers who are paid more stay longer in teaching, and that teachers with higher opportunity costs, as measured by test scores or degree subject, stay in teaching less time than other teachers.

168. Using more refined estimation techniques and better measures for opportunity costs, Dolton and van der Klaauw (1999) reach similar conclusions. The authors examine what influences a teacher's propensity to leave teaching for a different career of for a non-labour market alternative. Their study distinguishes between the different destinations (non-teaching job versus non-employment) and reasons for leaving the job or occupation (voluntary exits for career reason, exits caused by a contract ending, or

because of family reasons). However, their analysis suffers from a main limitation: non-pecuniary characteristics of activities were not considered. The data set corresponds to a large sample of individuals who graduated from universities in the United Kingdom in 1980. An unusual feature of these data is that observations on earnings are available for the individuals in the sample at several points in their career. The results of their research point to the importance of salaries and relative foregone earnings in turnover decisions. Higher opportunity salaries increase the tendency among teachers to switch careers and leave the profession voluntarily. Conversely, the intensity of leaving teaching for the non-employment state and the propensity to quit teaching either involuntarily of for family reasons is solely influenced by teacher salaries, not by salaries in the outside option.

169. In the same context of teaching duration, Stinebrickner (1999a) confirms the importance of relative salaries. Stinebrickner proposes a structural dynamic model, which includes information on some non-pecuniary aspects of teaching. In this way, he is able to analyse the effects of policies that change the career wage structure of a person and he can examine the potential effectiveness of improving the non-pecuniary aspects of teaching (for example, by decreasing the pupil-teacher ratio in schools) relative to the commonly proposed wage increases. Quite appropriately, he points out the fact that ignoring school characteristics may lead to incorrect conclusions about the effects of wages if wages are correlated with omitted non-pecuniary school characteristics. The model is estimated using the National Longitudinal Study of the Class of 1972 (NLS-72). The results suggest that educational policies which target teaching wages may be more effective than educational policies which target the non-pecuniary aspects of the teaching profession (at least in terms of the pupil-teacher ratio). These results are consistent with the non-structural findings of Stinebrickner (1998, 1999b) which used this data and found wages to be a more significant predictor of teaching spell duration than the student-teacher ratio. Similar analyses by the same author (Stinebrickner, 2001, forthcoming) provide similar results. This set of studies suffer from two main limitations: the results relate to an old 1972 cohort and non-pecuniary characteristics of teaching are limited to pupil-teacher ratios and ability level of students.

170. Focusing on the decision to become a teacher, Dolton (1990) investigates the relevance of relative earnings and personal non-pecuniary factors. He models the decision to enter the teaching profession using a large cross section data set on United Kingdom graduates. The results suggest that relative earnings in teaching and non-teaching occupations and the corresponding growth in earnings in the two choices have a marked effect on graduates' choices. In particular, the lower are relative wages or wage growth in teaching, the less likely is a graduate to choose that career.

171. According to studies conducted by Hanushek and Pace (1994, 1995), relative earnings seem to be less relevant when the decision is whether to enter teacher training or not. They analyse the choice of preparing for a teaching career in college. They use the High School and Beyond longitudinal data set following American high school seniors from 1980 to 1986. The results for the effects of teacher salaries do not indicate that they have a particularly powerful influence on student choices. Even though relative earnings of teachers compared to all college graduates vary considerably across the United States, they do not have a large or statistically significant impact on student preparation for teaching.

172. The influence of salaries on the decision of whether or not to switch teaching locations has been studied by Hanushek, Kain, and Rivkin (1999). This paper relies upon a panel data of the UTD Texas School Project to investigate how shifts in salary schedules affect the composition of teachers within a district. Among other things, they study the relationship among mobility, school district pay and other characteristics by investigating the determinants of transitions both between and out of Texas public schools. The pattern of teacher transitions provides strong evidence that teachers prefer particular student characteristics and somewhat weaker evidence that salaries affect transitions. In fact, the evidence strongly suggests that teachers prefer certain types of students over others. Except for Black teachers, the typical Texas teacher appears to favour higher achieving, non-minority students. Net salaries adjusted for

compensating differentials also appear to influence mobility and exiting, but to a lesser extent than characteristics of students.

173. There is also evidence on the decision of whether to return to teaching after a career interruption. According to Murnane (1996), in the United States, approximately one in four teachers who leave the classroom return within five years. Beaudin (1993) finds that the teachers most likely to return are those with subject area specialities that provide limited opportunities for better paying employment outside of public schools, those who have more than two years of experience coupled with a master's degree, and those who interrupted their careers at an older rather than a younger age. This pattern supports the hypothesis that decisions to return to teaching are sensitive to opportunity costs.

174. Responsiveness to relative earnings greatly depends on personal characteristics. For instance, as pointed out in chapter 2, incentives have different effects for teachers with different teaching experiences. In fact, attrition rates seem to follow a U-shaped distribution (see Grissmer and Kirby, 1987). Young, inexperienced teachers tend to have high attrition rates. Then the probability that a teacher leaves the profession declines with experience before it begins to climb again as teachers approach retirement age. This pattern has been recently confirmed by Stinebrickner (1999b). According to his results, the early years are very important in determining whether a teacher has a long career in the field. The teacher's probability of exiting teaching increases in the initial four years of the teaching career but then begins to decrease dramatically. These results suggest that policies aimed at reducing teacher attrition should focus on the early years of teachers' careers.

175. It has also been suggested that the responsiveness depends on the academic ability of individuals. Stinebrickner (2001) shows that individuals with higher academic ability, as measured by scores on the SAT exam, teach in a smaller proportion of years than other teachers. His results support the notion that lower teaching participation rates for academically gifted teachers stem in part from the ability of these teachers to obtain wage premiums in the non-teaching sector but not in the teaching sector. According to the analysis carried out in this research project, from the standpoint of improving the ability composition of the teaching workforce, policies which reduce the rigidity of the teaching wage structure by allowing wage increases to be correlated with the opportunity costs of teachers are likely to be more promising than traditional, uniform wage increases. The same type of conclusions were reached by Murnane and Olsen (1990).

176. Some studies also show that high school teachers tend to stay in teaching for a shorter duration than primary school teachers do (Murnane and Olsen, 1989, 1990, Murnane et al. 1989). Furthermore, career paths of secondary school teachers also differ depending on subject specialities. Murnane et al. (1988) based on a sample of North Carolina teachers who began their careers in the late 1970s, show that chemistry and physics teachers tended to leave teaching sooner than did secondary school teachers with other subject specialities. In addition, they were also more unlikely to come back to teaching once they had left the system.

177. Another important aspect is that women and men respond differently to incentives. Many studies have pointed out to the fact that women leave the profession for different reasons. In particular, Murnane et al. (1988) suggests that young women are typically the teachers with the shortest spells. Finally, Dolton and van der Klaauw (1999) have identified the following effects: women from higher social classes and privileged schools are more likely to leave the workforce; those with an education degree are less likely to quit teaching and to leave for a non-teaching job; those with professional postgraduate degrees are more likely to leave teaching, irrespective of destination or reason; those who initially entered the profession reluctantly are more likely to exit involuntarily or for family reasons and to exit to the non-employment state.

4.3.3. Career Structure

178. Most teachers in most countries work in schools that employ uniform salary scales. Under such salary structures, a teacher's salary is determined exclusively by educational credentials and years of teaching experience. All teachers with the same credentials and experience receive the same salary, irrespective of subject speciality or perceived performance.

179. In this context, it has been difficult to conduct research on how teachers respond to career opportunities provided by specific career structures. A single study, Brewer (1996), provides some evidence on this issue. Brewer tests the hypothesis that later career opportunities affect quit decisions by examining the relationship between teaching and school administration.

180. Emphasising the fact that in most cases it is not clear what are the later opportunities for individual teachers, the author intends to provide some evidence on the effect of promotion prospects and rewards on the quit decisions of teachers. In particular, Brewer is interested in the responsiveness of teachers to later career opportunities in school administration. He tests the proposition that school administration affects teacher behaviour using a sample of newly hired New York teachers from 1978 to 1988.

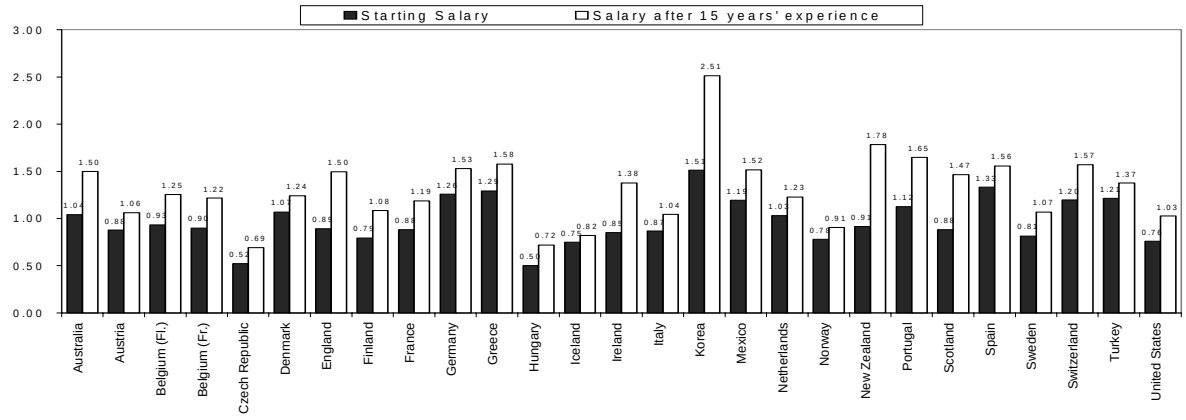
181. The results suggest that male teachers are somewhat sensitive to expected administrative rewards. Higher district salaries for new administrators in positions that teachers usually fill decrease the likelihood that a teacher quits their district. Conversely, if salaries for new administrators rise in the surrounding districts in the county, teachers are more likely to quit their districts. There is less robust evidence that more new openings in administration in a district decrease teachers' quit propensity. Finally, there is no evidence that female teachers respond to administrative variables, consistent with fewer opportunities and lower monetary rewards for women in school administration.

182. The author notes that, once tenure is granted, there are few opportunities for additional compensation within teaching itself. He further notes that there is evidence that variation in working conditions (for example, class size, type of students) serves as a form of compensating differential, with formal district rules and informal mechanisms rewarding experienced teachers with desirable assignments.

183. An important aspect of career structure is the way salary schemes are shaped. In section 4.3.2, for example, it was indicated that teacher attrition is higher in the early years in the profession. This, together with the importance of salaries in teacher supply decisions, suggests that relative salaries for starting teachers are very relevant in the development of strategies seeking to retain young teachers in the profession. In figures 4.1 through 4.3, information about the difference in salaries between starting teachers and teachers with 15 years of experience is provided for a set of OECD countries.

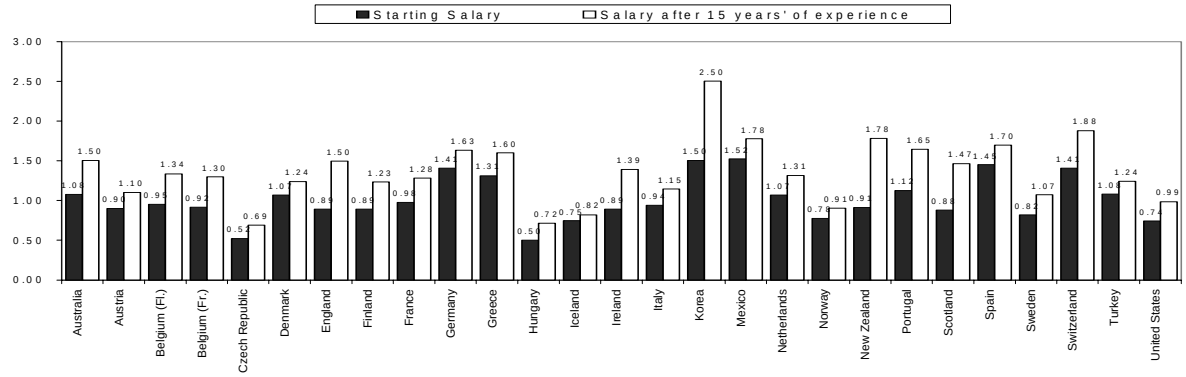
184. Data suggest that countries differ considerably in salary structures. Some have salary schemes highly progressive in years of experience (for example, Korea, New Zealand, England and Scotland, Ireland) while others have considerably high relative starting salaries (for example, Austria, Norway, Czech Republic, Denmark, Iceland, Sweden).

Figure 4.1: Ratio of teachers' salary to per capita GDP, Public Institutions, Primary Level of Education, 1999



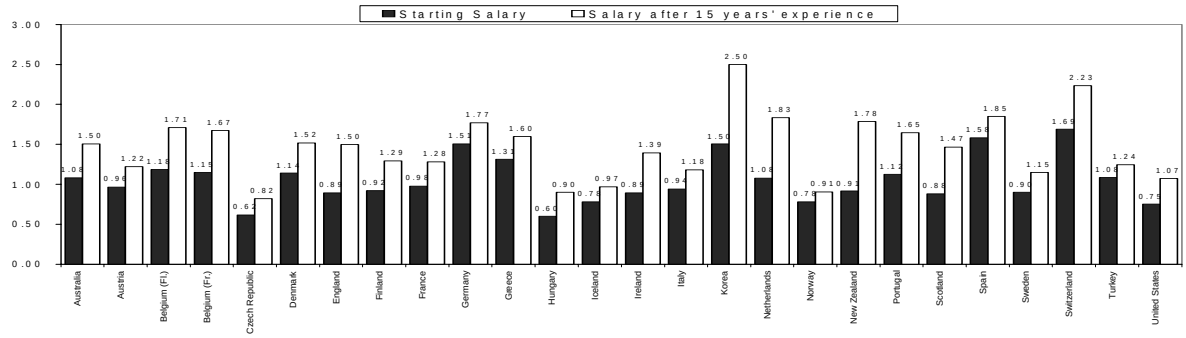
Source: OECD Education Database.

Figure 4.2: Ratio of teachers' salary to per capita GDP, Public Institutions, Lower Secondary Level of Education, 1999



Source: OECD Education Database.

Figure 4.3: Ratio of teachers' salary to per capita GDP, Public Institutions, Upper Secondary Level of Education, General Programmes, 1999



Source: OECD Education Database.

4.3.4. Merit-based incentives

185. Many policy makers argue that improving the quality of education offered by public schools requires a change from uniform salary schedules to a compensation scheme that bases a teacher's salary on performance as measured either by gains in student test scores or by supervisors' evaluations of the teacher's actions in the classroom. Such performance-based compensation plans are typically called merit pay.

186. In the United States, most attempts to implement merit pay for public school teachers over the last seventy-five years have failed. In the face of opposition from teachers and teacher unions, school systems that have introduced merit pay have generally backed away after a few years. According to Ballou (2001), "We've tried it and it doesn't work" summarises the prevailing view of merit pay among educators. Murnane (1996) reinforces this view by noting that the results of extensive research lead to the conclusion that merit pay based on supervisors' performance evaluations simply does not work. He details that, in the vast majority of cases where school districts have adopted merit pay plans for teachers, they have dropped them within five years. He points out that there is no example of a troubled district that has successfully used merit pay to improve its performance

187. In a highly influential paper, Murnane and Cohen (1986) argue that teaching is not an activity that satisfies the conditions under which performance-based pay is an efficient method of compensating workers. As a consequence, the authors claim that merit pay does not provide a solution to the problem of motivating teachers.

188. Murnane and Cohen base their conclusion on the following ideas. First, teachers' output is hard to observe. It is a joint product in which the several contributions can be difficult to isolate. In addition, some results of the educational process are difficult to measure. Compensation algorithms that reward only those dimensions of performance for which each teacher's contribution can be measured could create perverse incentives (for example, teaching to the test), inducing teachers not to engage in teamwork. Secondly, administrators are often unable to explain why one teacher is more effective than another. As a result, they cannot detail the basis for merit awards to those denied them or indicate what steps the latter can take to succeed next time. Finally, competition for merit awards can result in opportunistic and non co-operative behaviour among teachers.

189. In a recent paper, Ballou (2001) re-opens the issue by comparing the use of merit pay in public and private schools. Ballou argues that, given the general absence of strong competitive pressures in public education, school administrators may lack the incentives to undertake unpopular reforms. According to the author, public school administrators, particularly in unionised systems, lack many of the powers and prerogatives enjoyed by managers in business, a circumstance that can make it difficult to implement personnel policies that create resentments among staff.

190. He then suggests comparing public elementary and secondary schools to their counterparts in the private sector. As private schools operate in a competitive business environment, the notion that merit pay has failed because it is inherently ill suited to teaching, and not because of weak management, can therefore be tested by comparing the use of performance-based pay in public and private schools.

191. The author concludes that teacher unions have played a key role in obstructing the spread of incentive pay plans in the public sector. In those districts where teachers do not have union representation in collective bargaining, the incidence of merit pay is nearly as great as it is among the nonsectarian private schools. In the same way, the size of merit awards also exhibits an inverse relationship to the degree of

union influence: indeed, there is no detectable impact on recipients' salaries in districts where teacher unions engage in collective bargaining.

4.3.5. Working conditions

192. Satisfaction in the workplace is naturally associated with working conditions. In the particular case of teachers, working conditions are more often associated with factors such as:

- Class size, number of classes taught, teaching load;
- Percentage of class time spent in areas outside of a teacher's certification area;
- Flexibility to take temporary leaves;
- Composition of the student body, composition of the faculty;
- Percentage of time spent in out-of-classroom activities;
- Safety;
- Quality of facilities;
- Quality of instructional materials;
- Opportunities for participation in professional development activities;
- Opportunities for collaboration and decision-making.

193. Little research has been devoted to the role of working conditions in the supply decisions of teachers. One of the few studies devoted to it is Mont and Rees (1996). The authors examine the effect of class load characteristics and other factors on teacher turnover. Unlike previous studies, factors such as class size, number of classes taught, and percentage of class time spent in areas outside of a teacher's certification area are included along with salary, personal characteristics, and district characteristics in a model to simulate the effects of changing classroom characteristics on high school teacher turnover. The paper uses data from the New York State Education Department's Personnel Master File for the years 1979 to 1989.

194. The issue is relevant, as a solution for reducing the effects of teacher shortages is to raise teaching loads. In this context, it is important to investigate whether teachers respond to larger or more frequent classes by quitting, in which case such policy could simply be increasing demand for new teachers.

195. The results indicate that class load characteristics are important correlates of job turnover. Average class size was found to be positively associated with the job separation of high school teachers, although this effect begins to occur at roughly the mean average class size in the sample. Similarly, teaching outside one's area of certification was also associated with higher job separation rates. It is reasonable to conclude, therefore, that efforts to reduce education costs by increasing class size and asking teachers to teach outside their areas of certification may be undermined by increased teacher turnover. However, this study concluded that, controlling for average class size, the number of classes taught seems to have no effect on teacher separation rates.

196. More recently, in the context of American schools, Stinebrickner (1999a) concludes that the pupil-teacher ratio plays a significant role in whether the individual considers a school to be desirable even if to a lesser extent than wages. He also concludes that the ability level of students does not have much of an effect on how the teacher views the school. As pointed out earlier, Hanushek, Kain, and Rivkin (1999), when focusing on the reasons why teachers switch teaching locations, identify the characteristics of the student body (income, race, and achievement) as extremely relevant.

197. Another aspect deemed relevant in the teaching profession is its "flexibility" side. This aspect is particularly important for women who are predominant in the profession. Flyer and Rosen (1997) investigate whether teaching provides more flexible movements between the market and home sector relative to other occupations and if this "flexibility" option is valued. This issue becomes more important as greater market opportunities for women raise the supply price of teaching. Their model is applied to National Longitudinal Survey of Youth (NLSY, 1979-1991) female college graduates to determine whether transitions between the home and the market sector are less costly for female teachers than for other female graduates. The empirical findings are affirmative. Teachers do not suffer wage penalties for time spent out of the labour market, while other college graduates take wage hits of roughly 9 percent for each year spent out of the market sector. Most importantly, such "flexibility" of the teaching profession is shown to be an important attraction to women.

198. The influence of other factors such as safety, quality of facilities and instructional materials, or possibility of participating in professional development activities, has not been addressed by the empirical literature.

199. Finally, an increasingly important aspect of working conditions, related to the opportunities for decision-making, is the degree to which teachers are given responsibility for and authority over their work. This dimension will be referred to as teacher professionalism and the next subsection is devoted to it.

4.3.6. Teacher Professionalism – Status of the Profession

200. Many policy makers advocate that teachers should have professional autonomy and responsibility similar to that typically accorded to members of other professions. They argue that conferring professional autonomy to teachers will enhance the attractiveness of the profession as a career choice and will improve the quality of the classroom teaching practice. Most importantly, it is argued that increasing the professionalism of teaching will improve the status of teachers, an aspect considered crucial by many policy makers to raise the attractiveness of the profession to desirable levels.

201. Arguments for "empowering" teachers are typically the following:

- Recognition that teaching is too complicated and context-specific to regulate centrally;
- Central regulation may be an important contributor to teacher attrition as it decreases the attractiveness of the profession;
- Teachers deserve to be "treated better";
- The quality of classroom practice would be improved.

202. In turn, arguments against "empowering" teachers are typically the following:

- The quality of teaching and teachers is so low that we cannot entrust them with more autonomy and responsibility;

- Other factors besides teacher professionalism are considerably more important in defining the attractiveness of the profession;

- The quality of classroom practice would not be improved.

203. Though these arguments are often made and are sensible, there is little research evidence to support them, and so there is still ample room for discussion. Typically, the "professionalisation" of teaching would involve policies such as:

- Decentralisation of authority over major aspects of school operations placing teachers in key decision making roles as council members;

- Well-defined certification standards giving control to a Professional teaching body over the number and origin of undergraduate degrees granted in education each year;

- In-service training;

- Peer instruction and evaluation;

- Rewards for teachers who earn additional credentials or who are more productive;

- Career ladders.

204. No research has been made on what would be the impact of implementing policies leading to a higher degree of professionalism on teacher supply. On the one hand, some teachers might find these policies difficult and time-consuming. They require special training for decision making and management and, in addition, require released time from instruction. On the other hand, many teachers might want teaching to become more professional, in the sense of becoming filled with high productivity individuals who receive rewards closely linked to their performance.

205. Another two aspects of initiatives seeking to promote the professionalism of teachers stand out. First, the notion of accountability acquires new importance: teachers would be given more responsibility for their own practices. In addition, this trend would require teachers to engage in research activities seeking to self-examine own practices, test new ideas, and improve their practices based on these examinations.

4.3.7. Personal Circumstances

206. Research by Stinebrickner (1999c) brings attention to an important phenomenon. Using data from the National Longitudinal Survey of 1972, his analysis finds that, contrary to the common notion that teaching exits are primarily the result of teachers leaving to attractive non-teaching jobs alternatives, approximately sixty percent of all exiting teachers leave the workforce altogether.

207. He finds that important reasons for leaving the workforce altogether are changes in marital status or changes which occur in the size of families. This aspect is likely to be important because a large percentage of starting teachers are both young and female. Results obtained by Stinebrickner (forthcoming) reinforce the idea that children play an important role in the decision to leave the workforce. If the decision to remain in teaching implies that day-care must be paid for, the birth of a child lowers the effective wage in the person's teaching job. This suggests that child-care subsidies may represent a cost-effective way to increase teacher labour supply. Similar results are obtained in Stinebrickner (1999b, 2001).

4.3.8. Teacher Training and Certification

208. The structure of teacher education and the requirements to obtain a teaching license have an important impact on the decision about whether to become a teacher or not. In a series of studies, Hanushek and Pace (1994, 1995) analyse the decision of college students on whether to complete a teacher training programme. They use the longitudinal data from the High School and Beyond survey that follows, in the United States, high school seniors from 1980 to 1986.

209. They conclude that college students are less likely to complete education majors in states that require candidates for teaching licenses to complete a relatively larger number of education-related courses. This requirement raises the cost of obtaining an education degree, especially for college students who either plan to teach for a few years before moving to another occupation or want to obtain a teaching license as "insurance" in case opportunities in other fields prove unattractive.

210. Similarly, the authors conclude that requiring applicants for teaching licenses to score above a pre-specified cut-off on a standardised test (National Teacher's Examination) reduces the number of college students who train to become teachers and the number of college graduates who obtain teaching licenses. Hence, barriers that states set up for certification indeed inhibit supply.

211. Another relevant aspect is how the existence of "emergency certification" mechanisms affects the decisions of individuals to become a teacher. Unfortunately, no empirical studies provide evidence on this issue.

4.3.9. Relative availability of positions

212. Career prospects are essential when deciding whether to train to become a teacher. In this context, the relative availability of teaching positions is a fundamental element in the supply decisions of individuals. In fact, if the probability of obtaining a teaching position declines it is likely that the proportion of college students preparing to teach also declines. Despite the importance of this effect, no recent empirical studies provide evidence on the extent to which supply is affected by the relative availability of teaching positions.

5. STRUCTURAL ELEMENTS SHAPING THE MARKET FOR TEACHERS

5.1. Introduction

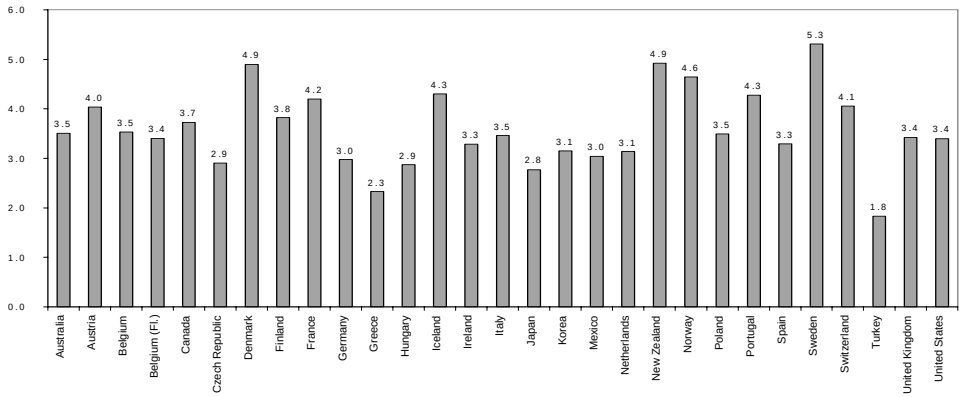
213. The market for teachers differs from a traditional labour market in that salaries are determined through a political process involving various levels of government, the public, and often teacher unions. If the demand for teachers increases as retirements and student enrolments increase, then starting salaries cannot be counted on to quickly move to the market-clearing level, and thus a shortage of teachers becomes a possibility. In addition, the control that school authorities have to improve the quality stock of its teachers through compensation, class size and other non-pecuniary job characteristics is surprisingly unclear. In a competitive achievement-maximising system, the collection of compensation, resources, alternative employment opportunities and local amenities would interact to determine the allocation of teachers, and schools with the most to offer among those competing would get the best teachers. This chapter describes the structural elements that shape the market for teachers. It starts by looking at the role of the several levels of government focusing on the policy tools they have available. It then moves onto the potential role of the market mechanisms that have been introduced in education markets, namely school choice. The next section concentrates on how the organisation of schools can impact the market for teachers. Finally, the important role of unions in this market is analysed.

5.2. The Role of Government

214. The role of government is fundamental in the management of teacher demand and supply. Its intervention is made at several levels: central, regional, or local. The responsibility in the management of public education is shared between the different levels of government and the schools. The degree of autonomy of each of these bodies differs from one country to another.

215. The importance of public education at the pre-college level can be assessed by looking at the expenditure associated with it as a percentage of GDP. Figure 5.1 provides such information. At the OECD level, countries differ substantially in resources devoted to pre-college education: while some spend an amount above 4 percent of GDP (for example, Denmark, France, Iceland, New Zealand, Norway, Portugal, Sweden, and Switzerland), others spend below 3 percent (Czech Republic, Greece, Hungary, Japan, and Turkey).

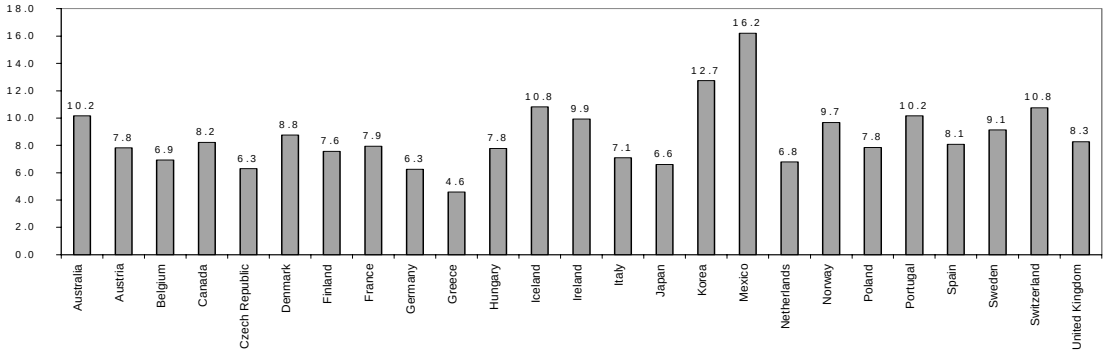
Figure 5.1: Public Expenditure on Education as a Percentage of GDP, 1998, Primary, Secondary, and Post-secondary non-tertiary Education



Source: OECD Education Database.

216. Figure 5.2 describes the importance of pre-college education in total public expenditure. As anticipated, countries differ substantially in relative resources devoted to public pre-college education. Among countries most strongly committed to devote a substantial share of public resources to pre-college education are Mexico, Korea, Switzerland, Iceland, Portugal, and Australia. On the other hand, Greece, Czech Republic, Germany, Japan, and The Netherlands devote the lowest share of public funds to pre-college education.

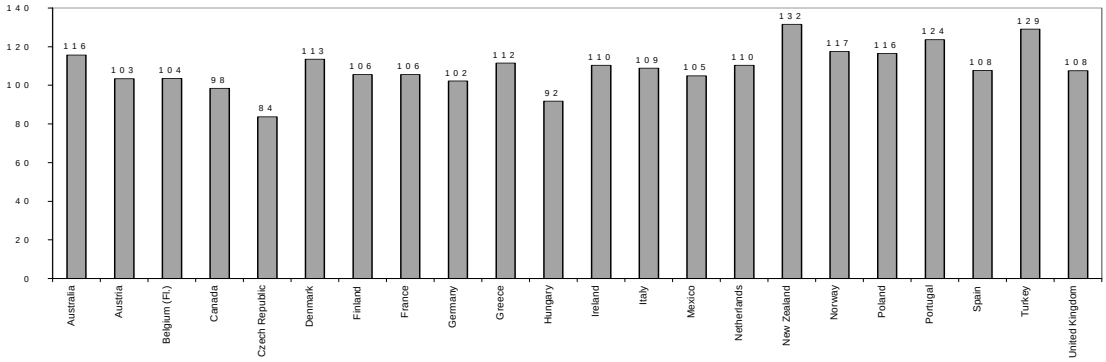
Figure 5.2: Public Expenditure on Education as a Percentage of Total Public Expenditure, Primary, Secondary, and Post-secondary non-tertiary Education, 1998



Source: OECD Education Database.

217. In figure 5.3, information is provided about the recent evolution in public expenditure on pre-college educational institutions. Most countries have substantially increased their investment in pre-college public institutions in the short time span under analysis (for example, New Zealand, Turkey, Portugal, Norway, Australia, Poland). The trend is clear in that all countries, except The Czech Republic, Hungary, and Canada, have increased their funding of pre-college educational institutions.

Figure 5.3: Change of Direct Public Expenditure on Educational Institutions, Index of change between 1995 and 1998 (1995=100), Primary and Secondary Education



Source: OECD Education Database.

218. Public authorities intervene in public schooling at numerous levels. One of the most important decisions concerns the distribution of decision-making responsibilities among the several levels of government, public school local agencies, and schools. This resolution defines which policy tools are available to each of the decision-makers.

219. In chart 4, a very detailed description of policy tools available to all decision-makers is provided.

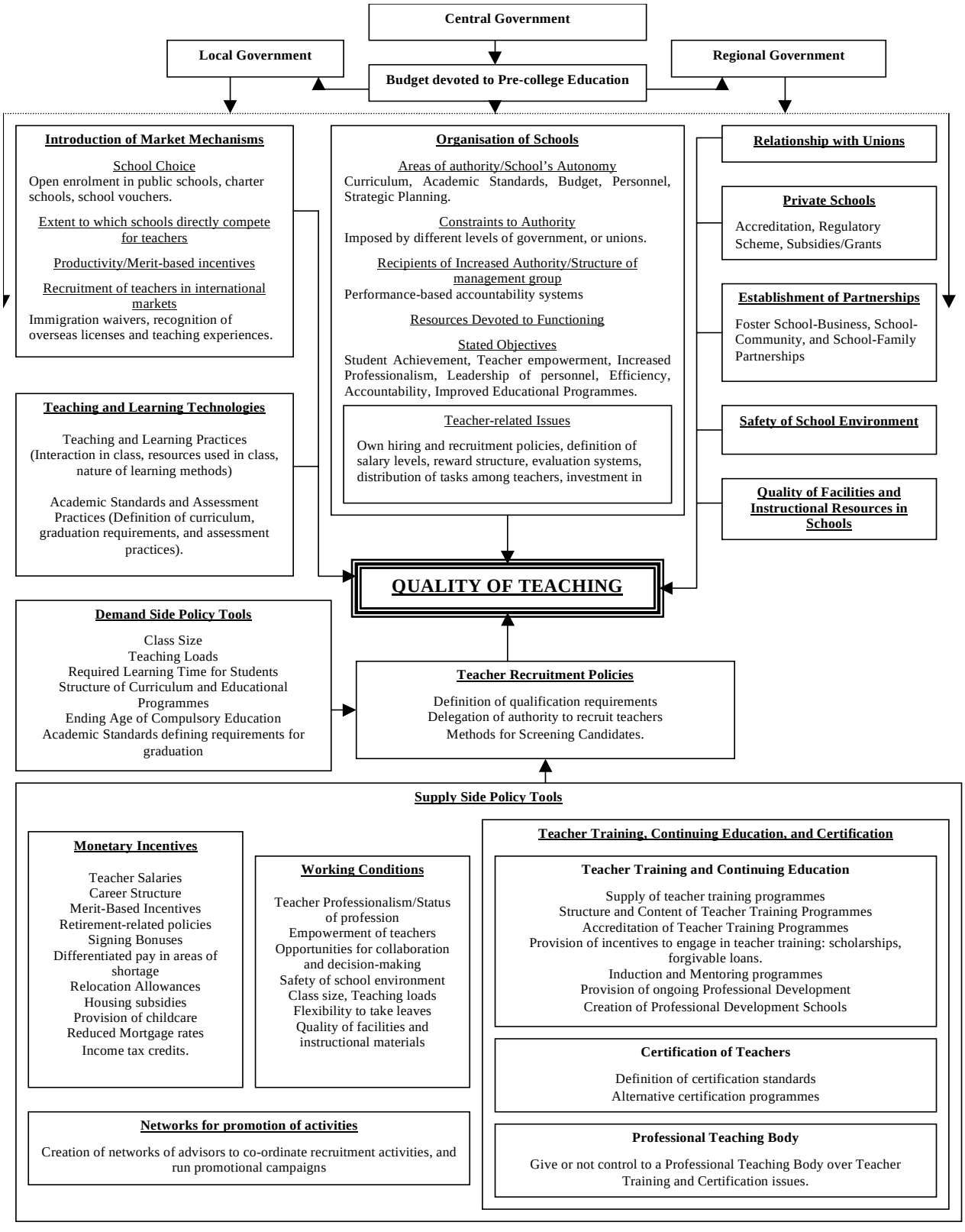
The areas covered are:

- The organisation of schools;
- The introduction of market mechanisms;
- Teaching and Learning technologies;
- Teacher Recruitment Policies;
- Tools for the management of teacher demand;
- Tools for the management of teacher supply;
- The relationship with unions;
- The presence of private schools;
- The establishment of partnerships;
- The quality of facilities and instructional resources;
- The safety of school environment.

220. Each of these areas has an impact on teachers and so is relevant for the management of teacher demand and supply.

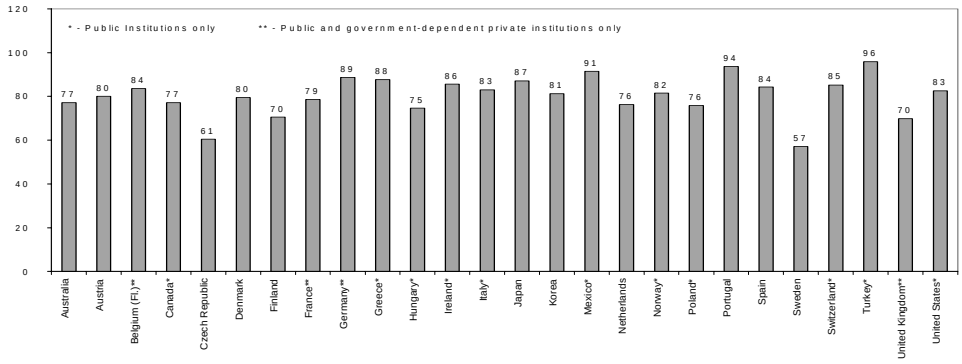
221. This description shows the extension to which the government can control the market for teachers. The market for teachers is unlike most conventional markets in the sense that the public sector dominates the demand for teachers and most governments are directly responsible for the supply of trained teachers. Both the supply and demand for teachers are politically manipulable. Since the government can determine pupil-teacher ratios and maximum class sizes, and alter the size of teacher training courses, it has direct control over most of the major determinants of teacher supply and demand. More overtly, since most governments decide on the size of public expenditure on education and determine teachers' pay, they have a pervasive influence over the market. In order for teacher labour markets to become increasingly subject to the typical market mechanisms present in most labour markets, initiatives such as school choice, increasing autonomy of schools in recruiting teachers and defining salary levels, introducing pay based on productivity, and opening the profession to international markets, would considerably help.

Chart 4 - Policy Tools/Areas Available to Educational Authorities to impact Teaching Quality



222. One of the main areas for governmental intervention is the monetary compensation of teachers in public education. It is important to assess the relative importance of salaries in total current expenditure on pre-college education. Figure 5.4 provides such information, at the OECD level, for 1998. The importance of salaries in total current expenditure in pre-college education is striking. Most countries devote more than three-quarters of their current budget in the monetary compensation of staff. In particular, countries such as Turkey, Portugal, and Mexico spend more than 90 percent of their current budgets on the compensation of staff. This reality implies that most countries have very little flexibility in their budgets to make investments in other areas relevant to the quality of the teaching pupils receive.

Figure 5.4: Compensation of teachers and other staff as a percentage of current expenditure, Primary, Secondary, and Post-secondary non-tertiary Education, 1998, Public and Private Institutions



Source: OECD Education Database.

5.3. Market Mechanisms

223. This section provides an overview on how the introduction of market mechanisms in the education sector impacts the market for teachers, in light of the results illustrated in the empirical literature. The results have been essentially driven by the increasing interest around the issue of "School Choice".[11]

224. Many research studies have focused on the impact of different forms of school choice on student achievement. In many countries, choice of parents on where to enrol their children is limited by their choice of residence as, once this choice is made, parents are restricted to enrol their children either in public schools within their district of residence or in private schools. Enlarging choice for parents can take several forms, the most common being:

- Open enrolment within the regular public system allowing parents to send their children to public schools outside their district of residence;

- Charter Schools: public schools that operate independently of the education bureaucracy's rules. It receives funding based on enrolment and the school's charter specifies the results for which it will be held accountable. If the school fails to deliver on these results, it receives no more public money.

[11] A detailed description of trends and policy activity regarding *School Choice* is provided in Hirsch (2002).

- Vouchers: it is a funding arrangement under which a government would provide each parental household with a warrant, certificate or voucher for each school-aged child, which would be redeemable at a public or private school of the parent's choice.

225. In a highly influential study, Rivkin, Hanushek, and Kain (2000) provide strong evidence suggesting that teacher quality is the most important within-school determinant of student outcomes.[12] In light of this result, the ultimate impact of school choice will greatly depend on how it affects the quality of teachers.

226. A study by Hoxby (2000a) examines how choice affects teachers. She investigates whether schools that face stronger choice-based incentives have greater demand for certain teacher characteristics and (if so) which teacher characteristics. The author uses data on traditional forms of choice (parents choosing a school by choosing a residence, choice of private schools) and a new survey of charter school teachers in the United States. The paper's empirical strategy is based on a simple economic argument: if schools that face stronger choice-based incentives have greater demand for a certain teacher characteristic, the wage they pay for that characteristic should be greater and the amount of that characteristic they hire should be greater. The test for whether a characteristic is demanded more by choice-driven schools is whether the characteristic is paid a higher wage and in greater abundance in them.

227. The evidence presented in the paper suggests that school choice could change the teaching profession by raising the demand for teachers with high quality college education, raising the demand for teachers with subject area (especially math and science) skills, raising the demand for teachers who make extra effort and are independent, and lowering the demand for certification.

228. In summary, the evidence suggests that school choice would create a more high-powered incentive environment within the teaching profession, in the sense that teachers would be required to have higher levels of human capital and effort in return for higher marginal wages for such characteristics. Hence, according to Hoxby, under increased school choice, less able or motivated incumbent teachers might find themselves earning smaller salary increases than some of their peers. Such teachers might be more likely to leave the teaching profession early. This would reverse the current pattern, in which able teachers are more likely to exit early.

229. Another way to gain insight into the effects of stronger market forces on the way schools hire teachers is by comparing public and regular private schools. After all, private schools are routinely subject to market forces and have an incentive to employ teachers who attract tuition-paying students. Ballou (1996) and Ballou and Podgursky (1997, 1998) provide a comprehensive comparison of public and private school teachers. They find that private schools value teacher aptitude more in hiring decisions than public schools do. They also find that teacher pay is less compressed and more closely related to aptitude and scarce skills (such as math and science skills) in private schools than in public schools. Ballou's conclusion is that public schools face little competition for students, and so do not invest sufficient effort in finding the best applicants for teaching jobs.

230. A particularly important aspect in the context of the market for teachers is the extent to which schools directly compete for teachers. Whether a school is or not the direct employer of teachers is an issue of crucial importance in defining how competitive the market for teachers is. In most countries, the recruitment of teachers is highly centralised either at the country level, regional level, or local level.

231. In recent work, Merrifield (1999) tests, for the particular case of the state of Texas, the hypothesis that teachers' salaries are affected by the competitiveness of their regional labour market. He

[12] See section 6.2.2. for details about this research study.

explains that the relatively unique feature of Texas that teachers' salaries are not determined by collective bargaining between district officials and teacher unions makes it especially well-suited to the task of disentangling monopsony effects from other labour forces. The results suggest that teachers are paid less in less competitive markets. He emphasises two important points. First, the problem of lack of competition is aggravated by the fact that most teachers cannot easily change careers since the skills of most teachers are often worth little in non-teaching jobs. Second, the employers of teachers being school districts and not individual schools, the consequences of the lack of competition are exacerbated. The important point is that reduced salary competition has significant policy implications as the attractiveness of the profession depends greatly on salary levels.

232. In this context, some ways to increase parental choice, by making schools the employers, might have a great impact on the level of competition in the markets for teachers. This is the issue explored by Vedder and Hall (2000). They argue that competition in the market for educational services also introduces labour market competition. They hypothesise that, by introducing viable private school alternatives, there should be greater salary competition between educational providers in order to lure better teachers, leading to greater salaries in public schools. Using detailed data on over 600 Ohio school districts, the authors find that increased private school competition does indeed lead to higher salaries for public school teachers.

233. Another important aspect of the consequences of the progressive introduction of market mechanisms is whether productivity is increased and, that being the case, whether it is related to an improvement of the quality of teachers drawn into the profession. Recent work by Hoxby (2001) addresses this issue. She first emphasises the importance of the productivity issue as the school choice impact on productivity potentially determines whether choice will benefit all children as opposed to specific subsets of children. The author presents evidence on three recent choice reforms: vouchers in Milwaukee, charter schools in Michigan, and charter schools in Arizona. In each case, she finds that regular public schools boosted their productivity when exposed to competition. Most importantly, she notes that one of the channels through which productivity increases is a different reward system that draws better individuals into teaching.

234. Along the same lines, Rapp (2000) investigates whether school choice enhances the work effort of teachers. The paper tests whether choice influences the behaviour of public school teachers, arguably the link between policy and outcome. Using data from the US Department of Education School and Staff Survey, he finds mixed results. He is unable to establish universal influence of school-system competitiveness on teacher effort. Neither "open enrolment" school-choice policies nor the traditional private school option and residential location option have a statistically significant effect on how much time teachers spend on their jobs outside of class time. However, where intradistrict choice plans are in place and are widely utilised, teachers spend far more time on their jobs.

235. Finally, a relevant issue is the impact of school choice on school atmosphere, a factor closely related to teachers' working conditions. In a recent paper, Hoxby (1999) seeks to find an answer to the question "If parents were given greater choice, how and what kind of schools would they choose?" Using rich data on schools, districts, and students across the United States, she finds that schools operating in metropolitan areas where parents can choose more easily among school districts exhibit more challenging curricula, stricter academic requirements, and more structured and discipline-oriented environments. Moreover, she finds that parents are more involved in school policymaking and visit schools more often when they have more choice. Choice appears to make parents more, not less, interested in what their local schools do. Such impact on school atmosphere is likely to affect the working conditions teachers have in schools.

5.4. Organisation of Schools

236. As a consequence of the view that increased resources in general do not "systematically" lead to improved student achievement,[13] education policy makers increasingly devote more attention to how resources are used. Cohen et al. (2000) note that researchers report that schools and teachers with the same resources do different things, with different results for students' learning. They indicate that resource use is influenced by the management of certain key problems of instruction, including co-ordination, incentives to use resources, and management of instructional environments. Along the same lines, Hanushek (1998c) emphasises that the current organisation of schools might explain why resources seem to matter less than expected: "The existing work does not suggest that resources never matter. Nor does it suggest that resources could not matter. It only indicates that the current organisation and incentives of schools do little to ensure that any added resources will be used effectively". He then suggests that more attention should be devoted to policies involving performance-based accountability in a context avoiding the centralised "command and control" perspective of much current policy.

237. This implies that the characteristics and organisation of schools are likely to gain increased relevance among policy makers. Reinforcing the importance of the organisational aspects of schools, Ingersoll (2001a, 2001b) investigates the effects of organisational conditions of the schools on teacher turnover. He uses data from the Schools and Staffing Survey from the United States Department of Education. He finds that, in particular, low salaries, inadequate support from the school administration, student discipline problems, and limited faculty input into school decision-making all contribute to higher rates of turnover, after controlling for the characteristics of both teachers and schools.

238. In this way, interest for developing policies aimed at improving the organisation of schools has spread. In particular, emphasis is being given to school-based management programmes linking performance to accountability. Many educational authorities are actively reviewing the concept of increasing the decision-making autonomy of individual schools. While there are many ways in which school-based management can be practised, all forms are based on the premise that schools become the centre of control in decision making. The rationale is that those who are closest to the primary business of schools will make the best-informed decisions. These policies are frequently advocated on the grounds that it increases the accountability of school personnel. Schools are forced to become more responsive to local needs through the inclusion of parents and community members on decision-making committees. In exchange for increased autonomy, schools are usually required to report their results to the central administration.

239. The structure of school-based management can vary greatly from school to school in three fundamental characteristics:[14]

- The authority that has been delegated;

  In turn, the nature of the authority delegated is defined by three elements:

  - *Areas of Authority:* Typical domains of authority are curriculum, budget, personnel, and strategic planning.

  - *Constraints to Authority:* Can be imposed at different levels by central administrations, district regulations, or unions.

[13] The view that more resources do not "systematically" lead to better academic results has had as main proponent Hanushek. The discussion on this issue can be found in section 3.3.1.

[14] This description is based on Summers and Johnson (1996).

- Recipients of Increased Authority

  The principal or a representative group.

- The resources devoted to the implementation of the management programme;

  Examples are training of school personnel, government or foundation funding.

- The stated objectives in introducing the school-based management programme.

  The emphasis is school-specific. In one school it might be on teacher empowerment and increased professionalism; in another it might be school climate. A typical set of objectives would include ownership, empowerment, professionalism, and leadership of personnel, efficiency, accountability, improved educational programmes, or most importantly student achievement.

240. Looking at the literature for the specific case of the United States, where quite a few school-based management programmes have been implemented, very little is found in terms of empirical or statistical evidence on the impact of school-based management programmes on student achievement. The fact is that there are very strong obstacles in the way of evaluating the impact of school-based management programmes on student achievement. In most cases the incentive programme is only a small part of a much larger reform initiative and it becomes very difficult to isolate the impacts of the incentive programme. In addition, school-management programmes exhibit many different designs and few identify student achievement as their main objective. The focus is often on organisational processes, with virtually no attention to how process changes may affect student performance.

241. An exception is recent work by Ladd (1999). The author examines how the Dallas Independent School District school-based incentive programme introduced in 1991 has impacted student outcomes. According to Ladd, the sophistication of the programme's methodology, the magnitude and nature of the rewards associated with the programme, and the fact that proponents view the overall accountability programme as the driver of a more comprehensive set of reforms justify a detailed investigation. This last factor provides a major advantage in order to identify the effects of the programme on student outcomes. Ladd uses a panel data set for schools in large Texas cities to measure the gains in student performance in Dallas relative to those in other cities. She finds positive and relatively large effects for Hispanic and white seventh graders, but not for black students. Other potentially positive changes include the fall in the Dallas drop-out rate relative to that for other cities and the fact that principals are being turned over more readily than in the past. These are encouraging but still very limited results.

242. In the context of teachers, the fundamental question is how much authority should be given to schools in the management of issues such as development of own hiring/recruitment policies, definition of salary levels, reward structure, or evaluation systems, distribution of tasks among teachers, or investment in continuing education. Most importantly, it would be interesting to think about whether systems should evolve to a situation in which schools "compete" directly for teachers using the common market mechanisms present in most labour markets.

5.5. The Role of Unions

243. In the market for teachers, unions play a very relevant role. Most research on such role address the issue of whether or not unions affect the productivity of public schools. In this context, Hoxby (1996) examines how teachers' unions affect the educational production function.

244. In her work, she considers that unions might affect the production of education at least through three channels. First, unions are expected to change – probably increase – the overall budget that funds school inputs. Second, unions are expected to reallocate any given budget among alternative inputs. This reallocation will generally be efficiency enhancing if the union's different objective reflects superior information but efficiency reducing if the union is rent seeking. Finally, because teachers interact with inputs to produce education, unions may affect the productivity of each input. For instance, if the union conveys superior information and class size reflects teachers' preferences as a result, then teachers may plan on smaller class size and make better use of it. In contrast, if the union performs a rent-seeking role and protects incumbent teachers from outside teachers competing for better-paid jobs, then a teacher salary increase may be less productive in a unionised school than in a non-unionised school.

245. Using panel data on United States school districts and state laws that facilitate teachers' unionisation, she finds that teachers' unions are primarily rent-seeking. More specifically, she finds that teachers' unions raise per-pupil spending, raise the share of spending devoted to inputs that have potential benefits for teachers, and lower student achievement by decreasing the productivity of these inputs. In addition, she makes clear that the potential effects of unions on schools are expected to be magnified when the market for schooling is imperfectly competitive. This is because rents will be available for rent-seeking unions and less information will be conveyed by the market in the absence of active choice among schools by parents and teachers.

246. This study is part of a literature on teachers' unions that has produced mixed results. In fact, the negative impact of unions on schools' productivity found by Hoxby (1996) has not gathered consensus. For instance, Eberts and Stone (1987) use the Sustaining Effects Survey and the High School and Beyond survey in the United States to find that union districts are seven percent more productive for average students. For students who are significantly above or below average, however, non-union districts are more productive by about the same margin, apparently because teacher unions reduce the use of specialised instructional techniques. The authors argue that the result is consistent with the view that unions tend to standardise the workplace. Along the same lines, Argys and Reese (1995) reach similar conclusions. In another study, Kurth (1987), the results suggest that the growth in teachers' unions during 1972-1983 was the most significant factor in the decline of student performance, as measured by SAT scores. Kleiner and Petree (1988), using state aggregate data from 1972 to 1982, find more generous resources and higher student performance in states where a greater share of teachers are unionised. In the same way, the work of Register and Grimes (1991) indicates that students in a unionised environment score higher on their college entrance exams than their counterparts from a non-union environment. More recently, Steelman et al. (2000), find a statistically significant and positive relationship between state teacher unionisation rates and state standardised student test scores. This decidedly mixed set of findings is due at least in part to differences in union measures employed, choices of dependent variables studied, units of analysis used, difference in demographic variables for which they control and other methodological issues.

247. Other aspects of the influence of unions on public schools have been studied. According to other studies, teacher unions increase salaries (Baugh and Stone, 1982) and costs (Eberts and Stone, 1986), alter the allocation of resources and the time teachers spend in the classroom (Eberts 1984), and influence district educational policies (Goldschmidt and Stuart 1986; Woodbury 1985).

248. Several other authors have pointed out numerous additional potential effects of unions. Among these, the following ones stand out:

- Strikes or threats of teacher strikes are seen as potentially disruptive;
- Potential over-regulation of the curriculum;

- Collective influence on legislators might be an impediment to educational reforms;
- Shield teachers from dismissal through seniority systems that is impervious to merit;
- Better pay and more secure working conditions that may attract higher quality individuals to the profession;
- Improve teaching environment guaranteeing smaller classes, time set aside during the school day for lesson preparations, and lighter teaching loads;
- Better define the standards of professionalism conducive to effective teaching;
- Strengthen the licensure procedures eventually boosting educational productivity;
- Increase the status of teachers.

6. TEACHING QUALITY

6.1. Introduction

249. A crucial outcome of the process through which supply and demand for teachers come into balance is the quality of the resulting teaching workforce, likely to have a fundamental impact on students' learning. This chapter is devoted to the quality aspects of teaching and seeks to describe the empirical evidence linking teacher quality and teaching environment to student outcomes.[15] It is assumed, as described initially in the proposed conceptual framework, that teaching quality depends on both teacher quality and teaching environment. In turn, teacher environment depends on teaching technology and school environment. The first part of the chapter starts by describing the measurable dimensions of teacher quality. It pursues by addressing the crucial issue of whether or not there is empirical evidence confirming the relevance of teacher quality for student achievement. Next, a literature review about the effects of measurable characteristics of teachers on student outcomes is provided. This section ends by assessing whether strategies raising salaries have a direct impact on students' learning. The second part of the chapter involves a description of the main elements composing what is called "teaching environment" and some empirical evidence on their impact on students' achievement. The main objective is to provide a brief account of what other factors besides teacher quality have a significant impact on the learning of students. The chapter comes down to a simple question of whether or not there are significant differences among schools and teachers in their abilities to raise achievement. Chart 5 provides a general overview of the factors, addressed in this chapter, which determine teaching quality.

6.2. Teacher Quality

6.2.1. Dimensions of Quality

250. There is strong consensus around the idea that teacher quality is indeed extremely relevant for student achievement.[16] However, far less consensus exists when it comes to define a good measure for teacher quality. The several studies that look at the impact of teacher quality on student outcomes have used many different observable characteristics of teachers to proxy for teacher quality. The most common are:

- Teacher Education/Subject-matter knowledge;
  - Number of undergraduate or graduate courses completed in field taught;
  - Whether teacher has a degree in the field he/she teaches;
  - Teachers' scores on National Teacher Examinations to assess subject matter knowledge;

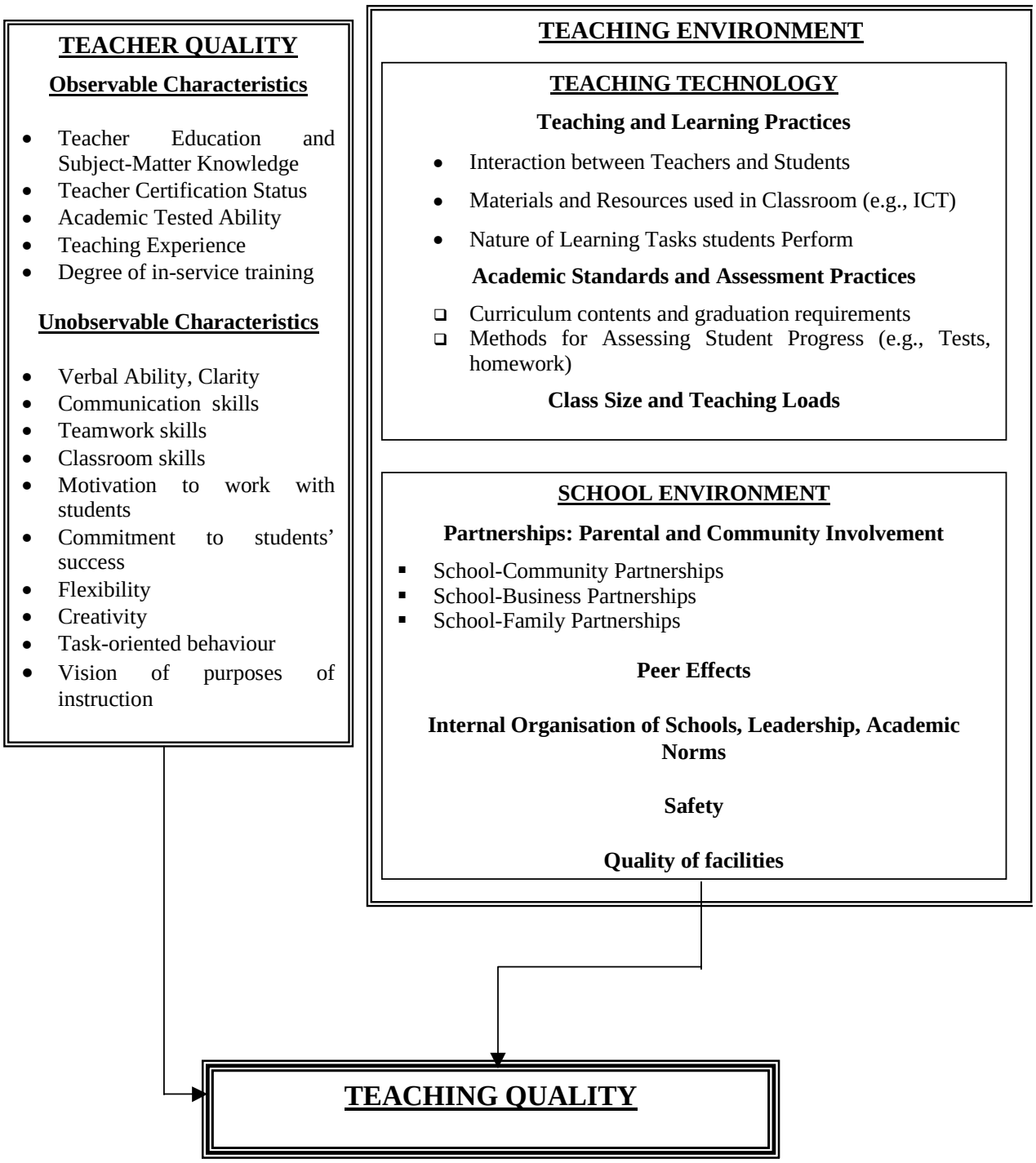
[15] An excellent report on how to promote good teaching is provided in OECD (1994).

[16] See next two subsections.

  - Selectivity of college attended;
  - Highest degree earned;
  - Education/Pedagogy coursework.

- Teacher Certification Status;
- Academic Tested Ability;
  - Scores of tests before entering higher education institution;
  - Measures of IQ.
- Teaching Experience;
- Degree of in-service training.

Chart 5 - The Determinants of Teaching Quality



251. The empirical evidence on the relevance of each of these dimensions of quality is explored in subsection 6.2.3. According to Hanushek (1997), available evidence indicates that the direct measures of teacher quality account for little of the variation in classroom performance. However this is not to say that these measures have no explanatory power. In a few words, as it will be seen in the next two subsections, quality of teachers matters but it is hard to predict who is going to be a good teacher just by considering observable characteristics. Unobserved (or unmeasured) factors such as verbal ability, pedagogical skills, ability to convey ideas in clear and convincing ways, ability to work in teams, ability to use a wide range of teaching strategies, enthusiasm, and motivation, are all extremely important. Unfortunately, the lack of indicators of teacher quality has hindered researchers' attempts to assess the importance of teacher quality on student outcomes. In the next two subsections, the empirical evidence on this issue is described.

6.2.2. The effect of Teacher Quality on Student Achievement

252. There is no consensus on the importance of specific teacher factors on the academic achievement of students. The empirical evidence on the role of observable characteristics of teachers on student performance is weaker than one might have expected. It may be that teachers are less important than initially thought. Alternatively, the explanation is that measurable characteristics such as teacher education, experience, or tested academic ability explain little of the true variation in teacher effectiveness. For this reason, it has been difficult to assess the relative importance of teacher quality on the academic achievement of students. The fact is that the dimensions described in the previous subsection are very far from providing good indicators of teacher quality.

253. In a recent important piece of work, Rivkin, Hanushek, and Kain (2000) are able to overcome this difficulty and provide compelling evidence that teacher quality is a very important determinant of student learning. They find the effects of teachers to be much larger than the effects of school organisation, leadership or financial conditions. In fact, they come to the conclusion that teacher quality is the most important within-school aspect explaining student performance.

254. The authors employ an extraordinarily rich data set for achievement of students in the state of Texas. The data contain 3rd, 4th, and 5th grade test scores for one cohort of students (4th graders in 1995) and 4th, 5th and 6th grade test scores for two other cohorts (4th graders in 1993 and 1994). The multiple cohorts and grades permit identification of teacher and school factors. The samples are very large, exceeding 3,000 schools and one half million students.

255. The rich data set together with sophisticated regression techniques permit the isolation of the influence of unobservable characteristics of teachers on student achievement. In this way, the influence of teacher quality on student outcomes can be assessed without limiting the analysis to the effect of measurable characteristics of teachers. This is the detail which gives much importance to the findings in this research project.

256. The paper disentangles the separate factors influencing achievement with special attention given to the contributions of teacher quality and class size. Estimates of teacher quality differences based entirely on within school heterogeneity indicate that teachers have powerful effects on achievement differences, though those differences are not captured by observable characteristics such as education or experience. The subsequent analysis estimates educational production functions based on models of achievement growth with individual fixed effects. It identifies a few systematic factors – a negative impact of initial years of teaching and a positive effect of smaller class sizes for lower income children in earlier grades – but these effects are very small relative to the effects of overall teacher quality differences.

257. The results suggest that policy initiatives should consider the substantial heterogeneity of teachers that exists among teachers with similar observable characteristics. The relevant point is that teachers with similar observable characteristics can be of very different quality. Hence, while this research highlights the importance of identifying high-quality teachers, there remains a large degree of uncertainty about the extent to which this can be achieved solely on the basis of observable characteristics.

6.2.3. Measurable characteristics of teachers and how they impact student outcomes[17]

258. A review of research on teacher characteristics, classroom performance, and student learning suggests that several kinds of teacher characteristics appear to be related to teacher effectiveness. In this subsection, the focus is on the impact of measurable characteristics of teachers on student achievement. The described experience is mostly for the particular case of the United States.

Teacher Education – Subject-Matter knowledge

259. In this subsection, the analysis concentrates on subject-matter knowledge, pedagogical preparation, and the impact of certain policy options.

260. No research directly assesses the impact of teachers' subject matter knowledge on student learning. To date, researchers conducting studies have relied on proxies for subject-matter knowledge, such as degree field, coursework on subject matter, or tested ability on subject matter. The research that does exist is limited and, in some cases, the results are contradictory. The conclusions do not provide evidence supporting a link between college study of a subject matter area and teacher effectiveness as strong as could be expected.

261. Several studies show a positive relationship between teachers' subject matter preparation and both higher student achievement and higher teacher performance on evaluations, particularly in mathematics, science, and reading (Darling-Hammond 1999a and 1999b, Goldhaber and Brewer 2000, Guyton and Farokhi 1987, Monk 1994). Another study, Monk and King (1994), finds both positive and negative, generally insignificant effects of teachers' subject matter preparation on student achievement. Similarly, Ferguson and Womack (1993) find that teacher's scores on national teacher examinations and grade point averages in the major accounts for only small proportions of the variance in teaching performance of prospective secondary teachers. In turn, Golhaber and Brewer (2000) find a positive relationship between teachers' degrees in mathematics and their students' test scores but do not find this relationship in science. Using the same data set, Rowan et al. (1997) find a positive relationship between student achievement in mathematics and teachers' majors in mathematics, but the effect size is quite small. In the same way, Monk (1994) finds no effect of having a full mathematics major even if having coursework in mathematics matters. In the same study, while the author identifies a significant positive relationship between teachers' coursework in the physical sciences and student achievement, he does not identify the same effect for coursework in life sciences.

262. It may be that these results are mixed because subject matter knowledge is a positive influence up to some level of basic competence in the subject but is less important thereafter. This interpretation is supported by the study by Monk (1994). Using data on 2,829 students from the Longitudinal Study of American Youth, Monk finds that teacher's content preparation, as measured by coursework in the subject field, is positively related to student achievement in mathematics and science but that the relationship is

[17] This subsection is partly based on Wilson, Floden, and Ferrini-Mundi (2001) and Darling-Hammond (1999b).

curvilinear, with diminishing returns to student achievement of teachers' subject matter courses above a threshold level.

263. It is certainly the case that the measure of subject matter knowledge makes a difference in the findings and contributes to results less consistent than expected.

264. Another important issue is the assessment of the importance of the value added by teacher education coursework or, more specifically "pedagogical preparation". "Pedagogical preparation" refers to the various courses that teachers take in such areas as instructional methods, learning theories, foundations of education, and classroom management.

265. Studies have found a somewhat stronger and more consistently positive influence of education coursework on teachers' effectiveness. However, research on pedagogical preparation has remained at a high level of aggregation, giving little detail about possible differences across grade level or subject area. Ashton and Crocker (1987) find significant positive relationships between education coursework and teacher performance in 4 of 7 studies they review. Likewise, Evertson, Hawley, and Zlotnik (1985) report a consistent positive effect of teachers' formal education training on supervisory ratings and student learning, with 11 of 13 studies showing greater effectiveness for fully prepared and certified versus uncertified or provisionally certified teachers. With respect to subject matter coursework, 5 of 8 studies they review find no relationship, and the other 3 find small associations.

266. In the same way, Monk's (1994) study suggests that undergraduate mathematics education coursework contributes more to student gains than do courses in undergraduate mathematics coursework. A similar result, albeit weaker, is found between graduate science education coursework and student achievement in science. In two other studies, Ferguson and Womack (1993) and Guyton and Farokhi (1987), results indicate that education coursework is a better predictor of teaching success than subject matter major or grade point average prior to entering the teacher education programme. However, Goldhaber and Brewer (2000), find that having a degree in education has no impact on student science test scores.

267. Another area of interest is the impact of certain policy options on the quality of pre-service teacher education. Several strategies have been proposed in this context. Among the most common, we have:

- Requiring accreditation for teacher training programmes;
- Definition of criteria for programme approval;
- Definition of standards and content for teacher education programmes;
- Mandating additional coursework;
- Setting limits on the number of credits required in education coursework;
- Define the amount of teacher testing;
- Holding teacher education programmes accountable for results of teacher testing;
- Requiring a subject matter major;
- Defining the equilibrium between subject matter and pedagogy courses;

- Establishing professional development schools;
- Define criteria for certification;
- Mandating induction programmes;
- Changing the duration of teacher preparation;
- Requiring a graduate degree in education.

268. Too few research studies have been conducted to make confident conclusions about the effects of such policies on the quality of pre-service teacher education. The results of papers addressing the effects of accredited programmes versus non-accredited programmes, four-year versus five-year programmes, and holding a master's degree versus not holding are reported.

269. Gitomer and Latham (1999) investigate whether accredited teacher preparation programmes impact teacher knowledge (measured by teacher certification test scores) more than non-accredited programmes. In the context of the United States, they use data on 300,000 prospective teachers who took the teacher certification tests between 1994 and 1997. They also have college entrance examination scores, so that they can take account of initial differences among students attending different programmes. In a comparison of accredited and non-accredited teacher preparation programmes, the authors find that, in the accredited programmes, a higher proportion of teacher certification test takers got scores high enough to meet state requirements. They conclude that the type of institution where teacher training is obtained might indeed have an impact on teaching ability as the difference in certification test scores cannot simply be explained by a difference in a programme's ability to attract "better" students, since the college entrance scores are actually lower in the accredited programmes.

270. A very debated policy is whether teacher preparation programmes should have a four-year or a five-year design. Andrew (1990) compares graduates of four-year and five-year programmes at the University of New Hampshire. His analysis suggests that there is a significant difference in retention and career satisfaction favouring five-year programme graduates.

271. Finally, another much debated policy option is the requirement of holding a graduate degree in education. In the United States, several states require that teachers earn a master's degree within a specific period of time after initial hiring. Policy makers raise many doubts about the efficacy of such policy. The fact is that the preponderance of evidence is that teachers with master's degrees are no more effective than teachers who do not hold these degrees. A summary of the evidence can be found in Hanushek (1986). More recently, Rivkin, Hanushek, and Kain (2000) find no evidence that having a master's degree improves teacher skills. As they emphasise, the results raise serious doubts about policies that require or strongly encourage graduate education for teachers. As a consequence, they question the current teacher pay systems, which reward teachers for holding a graduate degree. An additional consequence of such policy, as pointed out by Murnane (1996), is the fact that such requirement raises the cost of choosing teaching as a career and may have the effect of dissuading potentially effective teachers from entering the profession.

Teacher Certification

272. Certification or licensing status is a measure of teacher qualifications that combines aspects of knowledge about subject matter and about teaching and learning. Its meaning varies because of differences in licensing requirements, but a standard certificate generally means that a teacher has been prepared in an accredited teacher education programme and/or has completed either a major or a minor in the field(s) to

be taught with a minimum of education credits. In addition, obtaining a license might also depend on passing a national teacher examination and/or having a short teaching experience. More recently, as a way of reducing shortages in critical areas and attracting non-traditional entrants, authorities allow the hiring of teachers who have not met their licensing standards. Some allow the hiring of teachers with no license. Others issue emergency, temporary, or provisional licenses. And others provide alternative routes for certification. Most of these are master's degrees programmes which offer an education degree and are often targeted at mid-career entrants who already have a bachelor's degree. In other cases, candidates complete a short summer course of study and assume full teaching responsibilities, with or without completing additional coursework.

273. Relaxing requirements for certification is a way to attract academically talented college graduates to teaching, in part by reducing the amount of pre-service training that participants must undergo before beginning classroom teaching. These programmes can be attractive to academically talented candidates who intend to teach for a few years and then pursue other, more lucrative careers, because they provide an opportunity to enter teaching without taking a large number of pre-service teacher preparation courses. In light of shortages in critical areas it is indeed important to develop license requirements that do not discourage college students from considering teaching even if they do not plan to make it their life's work.

274. An immediate issue of interest is how, according to the empirical literature, certification status relates to teacher effectiveness. The research available points to the fact that, generally, a certification status is associated with higher teacher effectiveness. One study, Hawk, Coble, and Swanson (1985), finds that the students of certified mathematics teachers score higher on standardised mathematics tests than those of uncertified teachers. Similarly, using data from Texas, Fuller (1999) finds that students in districts with greater proportions of licensed teachers were significantly more likely to pass the Texas state achievement tests, after controlling for student socio-economic status, school wealth, and teacher experience. Teacher licensing was found to be especially influential on the test performance of elementary students. Along the same lines, in a recent school level analysis of mathematics test performance in California high schools, Fetler (1999) finds a strong negative relationship between average student scores and the percentage of teachers on emergency certificates.

275. In another study, Darling-Hammond (1999a and 1999b), the author finds a positive relationship between a state's percent of fully certified teachers and student achievement in mathematics and reading. The same study finds a negative relationship between student achievement and three indicators of a state's less-than-fully certified teachers: percent of all less-than-fully certified teachers; percent of new entrants to teaching who were uncertified; and percent of newly hired uncertified teachers. In turn, Goldhaber and Brewer (2000) find strong and consistent evidence that students of teachers who hold standard certification in mathematics achieve at higher levels in mathematics than students whose teachers are uncertified. However, the same authors find no difference in the achievement of students who had teachers with certification versus those with temporary emergency credentials. This conclusion is strongly challenged in a response by Darling-Hammond, Berry, and Thorenson (2001) in which they criticise the methodological grounding for the findings.

276. The question of whether alternative licensing programmes have a negative impact on teacher effectiveness is more controversial. Research indicates that alternative route programmes have been successful in recruiting a more diverse pool of teachers. However, the research shows that alternative routes have a mixed record in attracting the "best and brightest", many times the main objective for the existence of alternative routes. Feistritzer and Chester (2000) provide a good summary of the evidence.

Academic Tested Ability

277. One assumption in many studies of teachers' career patterns is that academic talent is a good indicator of teaching effectiveness. The empirical evidence is somewhat mixed. Some studies show that measures of teachers' academic talent are positively related to their students' test score gains. Ferguson (1991) and Ehrenberg and Brewer (1994) both find that measured performance on teacher tests and college selectivity are systematically related to student achievement, with test scores having the strongest link.

278. However, these results have not been supported by other research. Other studies find small and statistically insignificant relationships between teacher effectiveness and general academic ability and intelligence. Two reviews of such studies concluded that there is little or no relationship between teachers' measured intelligence and their students' achievement (Schalock, 1979; Soar, Medley, and Coker, 1983). It might be that the lack of a strong relationship between measures of IQ and teacher effectiveness is associated with the lack of variability among teachers in this measure and its tenuous relationship to actual performance.

Teacher Experience

279. Some investigation has also been devoted to assess the effect of teaching experience on student performance. The evidence currently available suggests that while inexperienced teachers (those with less than three years of experience) are typically less effective than more senior teachers, the benefits of experience appear to level off after a few years. Rivkin, Hanushek, and Kain (2000) conclude that there appear to be important gains in teaching quality over the first few career years but there is little evidence that improvements continue after the first two years. Rosenhotlz (1986) obtains similar results. Other studies find a relationship between teachers' effectiveness and their years of experience but not always an entirely linear one (Murnane and Phillips, 1981; Klitgaard and Hall, 1974).

Professional Development

280. Continuing Professional Development refers to specific episodes of on-the-job or in-service training. More recently it has received more attention from researchers and is potentially seen as a crucial factor in teacher effectiveness.[18] Presently, little evidence about the effects of continuing professional development on pupil attainment is available. The problem is that we still know very little about the nature and extent of professional development as an activity. The impression is that the activity is very diverse and the outcomes are very dependent on the particular circumstances in which it is undertaken.

281. There is a variety of types of professional development activities and also a multiplicity of providers. Typical in-service education activities are:

- Curriculum and performance standards;
- Uses of educational technology for instruction (namely information and communication technologies);
- Methods of teaching in specific subject field;
- In-depth study in specific field;

[18] A detail account of Professional Development practices in several countries is provided by OECD (1998).

- Student assessment;
- Co-operative learning in the classroom;
- Working with special populations (such as culturally diverse students, students with limited proficiency in country's language, students with special needs);
- School management and leadership;
- Classroom management;
- Civic education, social and health education;
- Remedial education;
- School guidance and counselling;
- Pedagogical innovations;
- Relationships with parents/community.

282. Formal professional development typically consists of workshops, conferences, and summer institutes. These traditional approaches have been criticised for being relatively ineffective because they are usually short-term. They lack continuity through adequate follow-up and ongoing feedback from experts.

283. Some studies have found that higher levels of student achievement are associated with mathematics teachers' opportunities to participate in sustained professional development focused in content-specific pedagogy linked to the new curriculum they are learning to teach. One such study is Cohen and Hill (1997). They base their results on analyses of a survey that they administered to a random sample of California elementary teachers and on achievement scores for the students of these teachers. They report that when teachers had extensive opportunities to learn in what they called "student curriculum workshops" in elementary mathematics, their practices more closely resembled those envisioned by the new curriculum framework and their students' achievement on mathematics assessments was significantly higher. Studies with similar results are Wiley and Yoon (1995) and Brown, Smith, and Stein (1995).

284. More recently, Wenglinsky (2000) links student results from the 1996 eight-grade National Assessment of Educational Progress tests, in the United States, to teacher education levels, years of experience, classroom practices, and professional development. This study finds that some kinds of professional development for teachers made a big difference. In mathematics, students whose teachers received professional development in working with special populations (such as culturally diverse students, limited English proficient students, and students with special needs) outperformed their peers, as did students whose teachers received in-service education in higher-order thinking skills. In science, students whose teachers received on-the-job education in laboratory skills also outperformed their peers. In addition, this study finds connections between teachers' academic background and participation in professional development. Teachers who have majored in the relevant subject area tend to spend more time in professional development.

285. Perhaps the most detailed and methodologically sophisticated study on the effects of a specific professional development programme is the one by Angrist and Lavy (2001). The authors present an evaluation of teacher training in Jerusalem elementary schools with the purpose of estimating the causal effect of a specific programme on pupils' test scores. The training programme was designed to improve the

teaching of language skills and mathematics. It was based on widely used pedagogical strategies ("Humanistic Mathematics" and "Individualised Instruction") originally developed in U.S. schools. In an attempt to overcome the methodological difficulties inherent in an evaluation study of this type, the authors explore the fact that in 1995 a handful of public schools in a Jerusalem received a special infusion of funds that were primarily earmarked for teachers' on-the-job training. According to the authors, this programme presents an unusual research opportunity because, even though the intervention was not allocated using experimental random assignment, the Jerusalem intervention can be studied with the aid of a matched group of students from schools not subject to the intervention. Considerable information is available on the students enrolled at the affected schools both before and after the intervention began. Similar information is also available for a group of comparison schools in adjacent neighbourhoods and elsewhere in the city, so these schools can play the role of a control group.

286. The results suggest that the training received by teachers in the non-religious branch of the Jerusalem school system led to an improvement in their pupils' test scores. The estimates for religious schools are not clear cut but, according to the authors, this may be because the training programme in religious schools started later and was implemented on a smaller scale. In an attempt to assess the economic value of the training programme, the authors of the study compare the treatment effect and costs of training to the effect size and costs of alternative school improvement strategies involving reductions in class size and lengthening the school day. Their analysis suggests that teacher training may provide a less expensive strategy for raising test scores than reducing class size or adding school hours.

287. However, professional development programmes can take many forms and can be applied to very different contexts. Their impact naturally depends on their specificity. But it seems clear that some forms of on-the-job-training can be very effective. In this way, researchers are appropriately moving from the question "Should we support in-service professional development?" to the question "What kinds of in-service professional development should be supported?"

6.2.4. Teacher Salaries and how they impact student performance

288. Given the importance of teacher quality on student learning, policy makers devote a great deal of attention to incentive schemes that can potentially increase the quality distribution of teachers. A salary structure that attracts academically talented graduates to teaching and makes it worthwhile to acquire the skills needed to teach effectively is a necessary condition for improving the quality of teachers. In section 4.3, the role of salaries on individuals' decisions on whether or not to supply labour as teachers, was analysed. In this section, the analysis concentrates on the impact of teacher salaries on the quality distribution of teachers.

289. The main question of interest is whether increasing salaries for teachers leads to a more qualified teaching workforce. In light of the absence of strong evidence supporting a strong positive impact of salaries on the quality of teachers, the interest then turns to the reasons why that happens. Finally, a description of reform policies seeking to strengthen the relationship between salaries and teacher quality, as featured in the research literature, is provided.

290. The relationship between teacher salaries and teacher quality has deserved much interest in the empirical literature. The results available seem to support the view that there is no strong positive effect of salaries on the quality distribution of teachers. In fact, some influential studies even conclude that teacher salaries have no impact on the overall quality distribution of the teaching workforce. In this category falls a comprehensive study by Ballou and Podgursky (1997). The authors offer a detailed economic analysis surrounding the debate over whether increasing salaries for teachers leads to a more qualified teaching workforce. The authors examine data from the U.S. National Center for Education Statistics on the make-

up of the teaching force and use, as indicators for teacher quality, academic performance in college and whether they have a degree in the subject they teach. They conclude that there is little evidence that higher salaries have raised the quality of newly hired teachers, at least by the indicators of teacher quality that were used.

291. Along the same lines, Hanushek, Kain, and Rivkin (1999) rely upon panel data about Texas schools to investigate how shifts in salary schedules affect the composition of teachers within a district. They use two separate approaches in an effort to identify fundamental features of the quality/salary relationship. First, they estimate the relationship between teacher certification test scores and starting salaries for four cohorts of new teachers. This methodology has the advantage that past salary levels are not relevant to the quality of first year teachers but the disadvantage that teacher test scores may not be a good measure of quality. Second, they directly estimate the relationship between student achievement and district salary schedules using both district and student fixed effects and controlling for student demographics. Importantly, they concentrate on differences among salary schedules as distinct from movements along given schedules. Overall, the results provide little support for the hypothesis that pay is an important determinant of teacher quality. The authors conclude that their analysis suggests that, as currently employed, salary policies do not appear to offer much promise for improvement in student performance. Similarly, Ballou and Podgursky (1995), using college admission standard tests as a measure of ability, find that an across-the-board raise in salaries produces modest improvements in the workforce at best. In another paper, Manski (1987) finds that salaries do not affect the ability distribution of new teachers but that they do affect the size of the teaching pool.

292. More positive results were obtained recently by Loeb and Page (2000). They argue that previous studies have failed to produce robust estimates because they lack adequate controls for non-pecuniary aspects of teaching and market differences in alternative occupational opportunities. In this study, using state-level data for the United States, the authors consider the potential importance of controlling for alternative labour market opportunities and non-pecuniary school characteristics when trying to assess the degree to which teacher wages affect student outcomes. They find statistically significant effects of teacher wages on high-school dropout rates and college attendance rates. The results suggest that raising the wages of teachers by 50 percent reduces high-school dropout rates by more than 15 percent and increases college enrolment rates by approximately 8 percent. In another paper, Figlio (1997) finds that, within local labour markets, there exists a significant positive relationship between teacher salaries and teacher quality, measured by undergraduate college selectivity and subject matter expertise. He uses data from the U.S. Schools and Staff Survey conducted by the Department of Education.

293. As just described, the results do not provide evidence supporting a strong relationship between salaries and teacher quality. To understand why this is the case, it is important to look at what happens in the teacher labour market when pay increases.

294. First, a crucial factor is associated with school systems' hiring and retention policies. Recruitment and retention practices are essential mechanisms through which salaries are potentially tied to teacher quality. The essential question is whether schools select higher quality teachers when the applicant pool expands.

295. Many authors have pointed out the fact that public schools do not exhibit a marked preference for teachers whose academic backgrounds signal strong cognitive ability and command of subject matter. One such study, Ballou (1996), reports the results of an investigation of the education and recruitment of prospective teachers, drawing on a series of large, nationally representative surveys of new college graduates in the United States. According to the author, these data enable him to separate the influence of academic ability on the self-selection of teacher trainees from its role in hiring decisions. The results show that college quality has virtually no influence on the likelihood that a candidate receives an offer of full-

time employment in a public school. Moreover, a degree in education carries more weight than a subject-area major. The author then argues that the fact that turnover is higher among teachers with stronger academic backgrounds does not justify giving preference to weaker students in recruitment. Ballou asserts that the evidence strongly suggests that public school officials undervalue cognitive skills and subject matter knowledge when screening new applicants and that hiring decisions are sub-optimal as a result. Ballou and Podgursky (1997, 1998) provide additional evidence that school administrators do not hire the best teaching candidates, thereby weakening the link between quality and pay.

296. There are various reasons why many schools do not value academic talent, according to Ballou (1996). Explanations include patronage, the weight attached to skills other than teaching ability such as coaching skill, and the possibility that academically strong candidates lack thorough teacher preparation. In addition, administrators' lack of interest in strong candidates may reflect the weakness of competitive pressures in public education. In fact, hiring practices differ substantially in the private sector (Ballou and Podgursky, 1998). A policy implication is that some sort of reform, focusing on administrators' decision-making, may be required.

297. A second factor, which potentially weakens the link between salaries and teacher quality, is the fact that higher salaries reduce quit rates, diminishing the number of vacancies and the demand for new teachers. In fact, although higher salaries do attract more talented graduates to teaching they also induce teachers to stay on the job longer, reducing opportunities to upgrade the teaching stock by hiring talented new applicants.

298. Finally, declining demand discourages prospective teachers, leading them to pursue other careers instead. In addition, the candidates with the best alternatives outside teaching, often the more academically able graduates, end up choosing a different occupation. Thus, salary increases have a two-edged effect on the supply of new teachers. On the one hand, higher pay is an inducement to teach. On the other hand, since jobs become more difficult to find, some potential teachers will not elect to pursue this career. Also, more capable individuals are more likely than others to be discouraged by the decline in the demand for new teachers. This is so because the opportunity cost of investing in teacher training is greater for them if no job results. As a result of these effects, the composition of the application pool may change very little.[19]

299. Another interesting aspect is that higher salaries might raise student achievement by raising the effort of current teachers. As Hanushek, Kain, and Rivkin (1999) state, this would be particularly the case if salary negotiations would explicitly link higher salaries with an expansion of responsibilities. Teachers may simply work harder in order to raise the likelihood of retaining their now more desirable job. In particular, one would expect untenured teachers to have the strongest response in terms of effort.

300. Taking into account this evidence, Murnane (1996) proposes a number of changes in the structure of teachers' salary schedules. According to Murnane such changes would make it easier to recruit talented college graduates in every subject field and would encourage them to obtain the training needed to learn to teach effectively. The proposed changes consist of:

- *Flexible salaries for teachers in fields with shortages of teachers:* Murnane notes that college graduates trained in specialities with the best salaries outside of teaching are the least likely to enter teaching, the most likely to leave teaching after only a very few years in the classroom, and the least likely to return to teaching after a career interruption. This evidence that career decisions are related to opportunity costs suggests that a policy of paying premiums to teachers in fields with shortages is an efficient strategy for attracting skilled teachers in all subject areas.

[19] The analysis just provided is based on Ballou and Podgursky (1997).

- *Large pay increase for passing the performance-based licensing exam:* Murnane proposes that with performance-based licensing, teachers with provisional teaching licenses, or "interns", would take the licensing examination after one or two years of supervised teaching. The payment of a large salary increase for passing the performance-based licensing exam serves, Murnane argues, two related purposes. It encourages apprentice teachers to seek training that will best help them pass the exam, and it encourages them to stay in teaching for at least a few years after passing the test. This is important because the effectiveness of teachers tends to increase markedly during their first years in the classroom (Murnane and Phillips, 1981; Rivkin, Hanushek, and Kain, 2000).

- *Incentives for licensed teachers to improve their teaching skills:* Murnane defends that giving all teachers an incentive to invest in improving their performance should be a major priority in educational reform.

6.3. Teaching Environment

301. In addition to teacher quality, a set of other factors affects the quality of the teaching the students receive. In the conceptual framework proposed in this document, this set of factors frames what is called the "Teaching Environment". In turn, the teaching environment is considered to result from the interaction of two other sets of factors: "Teaching Technology" and "School Environment". In what follows, the main elements characterising each of these two sets are described and some empirical evidence on their effects on student achievement is reported. The main objective is to provide a brief account of what other factors besides teacher quality have a significant impact on the achievement of students. Since most of these factors are less directly related to the management of teacher demand and supply, each section is limited to brief descriptions of main findings and issues.

6.3.1. Teaching Technology

Teaching and Learning Practices

302. The previous analysis of the effects of measurable characteristics of teachers reveals that such characteristics have a limited power to explain variations in student outcomes. Such fact together with strong evidence indicating that teacher quality is crucial in student learning suggests the relevance of unobserved characteristics of teachers. These are likely to be associated with what goes on in the classroom so that good and effective teachers are likely to be associated with more effective classroom practices. In this context, it becomes of crucial importance to identify the teaching and learning practices which better impact student learning.

303. In addition to being the mechanism through which improvements in teacher inputs might translate into higher student achievement, classroom practices may influence student achievement irrespective of the finances and qualifications of the teachers entering the classroom, and may even influence student achievement more strongly than teacher characteristics.

304. A possible classification of classroom practices is:[20]

- Interaction Between Teachers and Students

[20] As described in U.S. Department of Education (1999a).

- Interactions with the class as a whole;
- Interactions with small groups of students;
- One-on-one interactions with individual students;
- Lecturing by teacher;
- Talking with students;
- Having students talk among themselves.

- Materials and Resources Used in the Classroom
  - Printed materials (textbooks, worksheets; supplementary printed materials);
  - Educational technology (physical objects, blackboards, computers, electronic media, calculators, overhead projectors).

- The Nature of the Learning Tasks Students Perform in School and at Home
  - High-order thinking (conveying understanding: critical thinking, applying concepts to problems, simulations, concept put in another context);
  - Low-order thinking (conveying information: memorisation, solving problems that are similar to one another).

- Methods for Assessing Student Progress
  - Worksheets;
  - Open-ended problems;
  - Exploratory investigations;
  - Long-term projects;
  - Interdisciplinary problems;
  - Journal entries;
  - Homework;
  - Self-reflective writing;
  - Narrative writing;
  - Tests and assessments.

305. A good description of classroom practices in the context of the United States can be found in U.S. Department of Education (1999a).

306. To date, little is known about which strategies are most effective because large-scale studies relating classroom practices to student achievement have almost never been conducted. A good recent attempt to provide information on this issue is Wenglinsky (2000). The author uses data from the U.S. National Assessment of Educational Progress test administered to students across the nation every year or two in a variety of subjects. The author concludes that students whose teachers emphasise higher-order thinking skills and hands-on learning activities (for example, laboratory work in science) outperform their peers significantly. Also, students who frequently take tests outperform those frequently using on-going forms of assessment such as portfolios. Thus Wenglinsky's study confirms that what goes on in classrooms matters - effective teachers do things differently.

307. It is also important to make a special reference to the increasingly important role of Information and Communication Technologies (ICT). Technology, specifically in the form of computers and the Internet, has become a major focus of education policy in recent years. This topic goes beyond the scope of this document. A good perspective of the use of ICT in American schools is provided by U.S. Department of Education (2000). The issue of how ICT can be used in the context of potential teacher shortages, more of interest to the present document, has not been addressed.

308. Another increasingly common practice that should be mentioned is remedial instruction for poor achievers. This practice can be in the form of additional tutoring, smaller classes, or summer school, for instance.

309. The attitudes towards teaching defining teachers instructional approach are also of extreme relevance. The practice of unusually effective teachers is often associated with characteristics such as:

- Careful planning of lessons;
- Appropriate selection of materials;
- Goals clearly defined to students;
- Brisk pace maintained in classes;
- Regular checking of student work;
- Teach material again when students have trouble learning;
- Good use of time;
- Believe their students can learn;
- Believe they have a large responsibility in their students' learning;
- Vision of purposes of instruction shared with colleagues;
- Agree that schools' purpose is to promote students' learning;
- Strong commitment to students' academic success;
- Strong collegial relations;
- Flexibility

- Creativity;
- Adjust their teaching to fit the needs of different students;
- Use range of teaching strategies;
- Use range of interaction styles;
- Clarity in lecturing;
- Task-oriented behaviour;
- Use of students' ideas and suggestions.

310. These characteristics associated with more effective teachers are more carefully described in Darling-Hammond (1999a) and Cohen, Raudenbush, and Ball (2000).

Standards and Assessment Practices

311. Academic standards and expectations are a key component of any educational system. Unquestionably, the most important determinant of how quickly students learn is the effort of students themselves. It follows that an increase in schools' expectations of students can have important effects on the quality of public schooling. By setting a rigorous set of educational standards, schools can set up a set of incentives and rewards to promote student learning.

312. The most common way of increasing standards is to strengthen the curriculum in the several subjects and then test students periodically to check whether they are meeting the standards set for each grade. The pillars of content standards are then a specifically worded curriculum and achievement tests that measure how well students are learning the prescribed curriculum.

313. The main question of interest in this context is whether higher educational standards lead to higher effectiveness in learning. In a series of papers, Bishop (1996, 1997) gathers indirect evidence that such standards can improve the quality of education. For instance, he reports that students from the state of New York tend to outperform students from other states on standardised tests such as the Scholastic Aptitude Test. While there are literally dozens of potential explanations for such a finding, one is that New York has stood alone in setting a state-wide exam for high school seniors (the Regents Examinations). In the same context, Bishop has analysed performance of Canadian students on the 1991 International Assessment of Educational Progress (IAEP). Canada's educational system is in many ways similar to that of the United States, but significantly, many of Canada's ten provinces now require students to pass a province-wide exam before graduating from high school. Bishop finds that students from the provinces that have implemented graduation exams tend to perform significantly better on the IAEP. The results of Alexander (2000), Bishop (1999), Bishop et al. (2000), and Betts (1998) confirm the relevance of standards on student achievement.

314. Another component of a school's overall standards is the way in which its teachers define grading standards. If a school makes it easier to obtain a specific grade, students might respond by exerting less effort. Betts (1997b) examines grading policies in math and science courses in a representative sample of American schools. By comparing students' test scores in these subjects to their letter grades, he constructs measures of the grading standards at each school. He finds that American high schools differ radically in the way in which they assign letter grades to students of given achievement. Most importantly, he also finds that the stringency with which a school grades is strongly related to the rate at which students

learn. Even after controlling for the initial level of achievement of students at the school, traits of the individual student, traits of his or her family and peers, and detailed traits of the classroom, the school's grading standard remains a highly significant and positive predictor of gains in test scores. Unfortunately, a policy of higher standards does not improve the performance of all students identically. Although "C" students benefit from attending a more rigorous school, "A" students benefit even more.

315. Another step that a school can take is to also set "higher expectations" of its students. A primary example of this is for a school to encourage teachers to assign more homework to students. This policy also recognises that one of the most important inputs is the student's own effort. Betts (1997a) investigates the impact of homework student achievement using an American data set, the Longitudinal Study of American Youth. He finds a strong positive link between the amount of work that teachers assign and the rate at which the student's test score rises.

316. Many other relevant questions remain unanswered. For instance, what are the impacts of curriculum standards on course selection and school attendance of at-risk pupils? Will there be a trade-off between improved performance on the part of some students (for example increased college attendance) and lower retention rates on the part of others? Is there a risk that the "educational bar" will be raised too high?

Class Size and Teaching Loads

317. This issue was extensively covered in chapter 3, section 3.3.

6.3.2. School Environment

Partnerships: Parental and Community Involvement

318. An increasingly debated theme in educational reform is building partnerships – partnerships between schools, families, communities, and businesses. Thus far, such partnerships have had a specific and fairly narrow focus and often have limited reach in terms of the proportion of the target population served.

- *School-Community Partnerships:* Many community groups have reached out to public schools to address some of the most pressing community problems. The resulting partnerships include initiatives such as school-linked health centres, mentoring programmes, work-study programmes, or prevention of risk behaviours.

- *School-Business Partnerships:* Prompted in large part by concerns over the quality of the workforce and urban social and economic problems, many business groups have reached out to public schools. The typical partnerships are school-business initiatives aimed at improving the vocational exposure and job readiness of youths. More recently, private school management corporations are a new type of involvement of the private sector. Public-private partnerships are now widely advocated as very important to successful educational reforms.

- *School-Family Partnerships:* There are numerous examples of formal school-family partnerships, namely initiatives aimed at improving the school outcomes of children. Examples are intervention programmes for at-risk children, special schools and support programmes for in-school teenage parents, and both adult and family literacy programmes.

319. Most of these types of initiatives have not undergone rigorous evaluation to assess their effectiveness. The few existing results are generally disappointing. Maynard and Kelsey (1996) provide a good summary of the available evidence.

Peer Effects

320. Many argue that the composition of a school or classroom – that is, the characteristics of the students themselves – affect the educational attainment of an individual student. This influence of the students in a classroom is often referred to as peer effects. Peer effects are potentially important for understanding the optimal organisation of schools, jobs, and neighbourhoods. However, empirical analysis of peer effects on student achievement has been limited, and what exists has been open to question because of the difficulties of identifying peer effects per se.

321. Three recent studies provide evidence on the relevance of peer effects on student achievement. Hanushek, Kain, Markman, and Rivkin (1999), using data from Texas public schools at the elementary school level, find that the achievement level and racial composition of peers has a direct influence on achievement. All students appear to benefit from having higher achieving schoolmates, although the effect is quite small. The results further suggest that ability-grouping policies have primary influence on the distribution of performance and not the level. Moreover, schools with higher concentrations of minority students lead to lower achievement for Black students but minimal effects on Whites or Hispanics.

322. Along the same lines, Hoxby (2000e), also using data on Texas public schools, finds that students are affected by the achievement level of their peers: a credibly exogenous change of 1 point in peers' reading scores raises a student's own score between 0.15 and 0.4 points, depending on the specification. Although the author finds little evidence that peer effects are generally non-linear, she does find that peer effects are stronger intra-race and that some effects do not operate through peers' achievement.

323. Finally, Zimmer and Toma (2000) provide a similar analysis in an international context. In this research, the authors examine peer effects with a unique data set that includes individual student achievement scores and comprehensive characteristics of students, teachers, and schools for five countries (U.S., Canada, Belgium, New Zealand, and France). The data allow an examination of peer effects in both private and public schools in all countries. Their analysis indicates that peer effects are a significant determinant of educational achievement. The effects of peers appear to be greater for low-ability students than for high-ability students. The finding is robust across countries but not robust across school type.

Internal Organisation, Safety, Quality of Facilities

324. Environmental resources such as leadership (principal’s role), academic norms, arrangements for co-ordination within schools, institutional structures, safety, or quality of facilities also influence how teachers and students behave having a direct impact on the quality of the teaching. The influence of some of these factors was described in section 5.4. However, empirical evidence on the impact of elements such as safety or quality of facilities is practically non-existent.

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APPENDIX

CURRENT AVAILABILITY OF DATA AND RELEVANT DATA NEEDS

325. This appendix provides a description of the data considered to be relevant for developing a thorough quantitative analysis of the main issues identified in this document. It should be interpreted as a "close-to-ideal" set of data elements and not necessarily one that can be readily obtained in its entirety from the several countries. The structure on which this set of elements is based is the structure of the conceptual framework presented in chart 1.

326. In case a data element is currently available in OECD databases it is described in a "Current Availability" box. If such box is not available for a specific data entry it should be concluded that the corresponding data elements are not currently available.

327. It should also be noticed that OECD/INES (Network C) is currently preparing a survey on teaching practices and school organisation.

1. THE TEACHING WORKFORCE

1.1 Demographic Profile of Teachers

330. Level of detail: By Age-Range, Gender, Level of Education Completed, Subject Area, Years of experience.

CURRENT AVAILABILITY

OECD EDUCATION DATABASE

- Educational personnel (classroom teachers, teacher aides/teaching or research assistants, Pedagogical/Academic support, Health and Social Support, School Level Management, Higher Level Management, School Level Administrative Personnel, Higher Level Administrative Personnel, Maintenance and Operations Personnel) by:
  - Level of Education:
    - Pre-primary (ISC 0)
    - Primary (ISC 1)
    - Lower Secondary (ISC 2)
    - Upper Secondary (ISC 3)
    - Post-Secondary, non-tertiary (ISC 4)
    - First-Stage of Tertiary Education (ISC 5, 5A and 5B)
    - Advanced Research Programmes (ISC 6)
  - Type of Programme:

1. Educational/Labour Market Destination
2. Programme Orientation (General/Pre-vocational, Vocational)

- Employment status: full-time, part-time, full-time equivalent.
- Type of institution: Private versus Public

CURRENT AVAILABILITY(continuation)

OECD EDUCATION DATABASE

- Classroom teachers and academic staff by:
  - Level of Education:
    1. Pre-primary (ISC 0)
    2. Primary (ISC 1)
    3. Lower Secondary (ISC 2)
    4. Upper Secondary (ISC 3)
    5. Post-Secondary, non-tertiary (ISC 4)
    6. First-Stage of Tertiary Education (ISC 5, 5A and 5B)
    7. Advanced Research Programmes (ISC 6)
  - Sex
  - Age-group
  - Employment Status
- School Management personnel by:
  - Level of Education:
    1. Primary (ISC 1)
    2. Lower Secondary (ISC 2)
    3. Upper Secondary (ISC 3)
  - Sex
  - Age-group
  - Teaching Load

1.2 Teacher workforce as a percentage of total labour force

CURRENT AVAILABILITY

Available in OECD Education database

1.3 Outcome of Recruitment Process

331. Level of detail: By Subject area, grade level, region of country, type of school, type of educational programme.

- Number of "Difficult to fill" vacancies
- Proportion of positions filled by teachers on "emergency certification"
- Proportion of "unfilled" positions
- Data on the ratio of the number of applicants to vacancies in teaching
- "Out-of-field teaching" - Proportion of teachers working outside their areas of certification
- Methods used to cover vacancies "difficult" to fill in

  Possibilities: Substitute teacher, underqualified teacher, reassign other teacher, increase teaching load, hire part-time teacher, expand class sizes, cancel courses.

- Percent of secondary school teachers in each field without a major or a minor in that field
- License Status of teachers

  Possibilities: Regular or Advanced license, Probationary license, Substandard license, No license.

2. DEMAND FOR TEACHERS

2.1 Student Enrolment

332. Level of detail: By Educational/Grade level, subject area, region of country, age-range, programme destination.

CURRENT AVAILABILITY

OECD EDUCATION DATABASE

- Number of students enrolled by:
  - Level of Education:
    1. Pre-primary (ISC 0)
    2. Primary (ISC 1)
    3. Lower Secondary (ISC 2)
    4. Upper Secondary (ISC 3)
    5. Post-Secondary, non-tertiary (ISC 4)
    6. First-Stage of Tertiary Education (ISC 5, 5A and 5B)
    7. Advanced Research Programmes (ISC 6)
  - Type of Programme:
    1. Educational/Labour Market Destination
    2. Programme Orientation (General/Pre-vocational, Vocational)
  - Intensity of Participation: full-time, part-time, full-time equivalent.
  - Sex
  - Age
  - Type of institution: Private versus Public
  - Grade Level
- Number of students enrolled in grade 1 by sex, type of institution, and age.
- Number of foreign students by level of education, type of programme, residence status, EU/non EU countries, and sex.

Flows of students: Number of new entrants, re-entrants, and continuing students by level of education (Upper secondary, Post-secondary non-tertiary, and tertiary); Number of new entrants by level of education (Upper secondary, Post-secondary non-tertiary, and tertiary), sex, and age.

2.2 Number of educational institutions

333. Level of detail: By Educational level, type of institution, region of country, educational programme.

CURRENT AVAILABILITY

OECD EDUCATION DATABASE

Number of instructional educational institutions by type of institution (public, private), by level of education (Pre-primary, Primary, Lower secondary, Upper Secondary, Post-secondary non-tertiary, tertiary), by type of programme (General/Pre-vocational, Vocational)

2.3 Composition of the School-age population

334. Level of detail: By age, by gender, by region of country.

CURRENT AVAILABILITY

EDUCATION at a GLANCE 2000

- Percentages of 5 to 14, 15 to 19, and 20 to 29 in the total population;

  OECD-Ed.Database, Indicator A1 (EaG-2000)

- Change in the size of the youth population since 1990 and expected change until 2008 (Ages 5-14, 15-19, 20-29)

2.4 Course and graduation requirements/ Contents of curriculum

- Average number of hours of course work in specific subject areas by grade level and educational programme;
- Contents of flexible part of curriculum by grade level;
- Preferences of students over flexible part of curriculum;
- Requirements for graduation;
- Entrance requirements of colleges and universities.

2.5 Instructional Time Required for Pupils

335. Level of detail: By grade level, educational programme, and subject area.

CURRENT AVAILABILITY

EDUCATION at a GLANCE 2000

- Intended instruction time between the ages of 12 and 14 divided into compulsory and flexible parts of the curriculum (Only for lower secondary education);

  OECD-Ed.Database, Indicator D4 (EaG-2000)

- Number of instructional hours per week and number of instructional weeks per year (Lower Sec. Education)

  OECD-Ed.Database, Indicator D4 (EaG-2000)

- Intended instruction time for mathematics and science in hours per year for students aged 12 to 14 (Lower sec. Education)

  OECD-Ed.Database, Indicator D4 (EaG-2000)

- Instruction time per subject as a percentage of total intended instruction time.

  OECD-Ed.Database, Indicator D4 (EaG-2000)

2.6 Average Class Size

336. Level of detail: By grade level, educational programme, subject area, type of institution, region of country.

CURRENT AVAILABILITY

EDUCATION at a GLANCE 2000

Ratio of students to teaching staff by level of education (Early childhood, primary, lower secondary, upper secondary, tertiary)

OECD-Ed.Database, Indicator B7 (EaG-2000)

2.7 Teachers' teaching loads

337. Level of detail: By grade level, educational programme, subject area, type of institution, region of country.

CURRENT AVAILABILITY

EDUCATION at a GLANCE 2000

- Statutory number of teaching hours per year in public institutions by level of education (primary, lower sec., upper secondary (general and vocational programmes)

  OECD-Ed.Database, Indicator D3 (EaG-2000)

- Number of hours in the school week that 8th-grade mathematics teachers have formally scheduled for teaching and non-teaching activities.

  IEA/TIMSS, Indicator D3 (EaG-2000)

- Number of hours of work per week to earn their Full-time salary

  OECD-Ed.Database, Indicator D3 (EaG) (Observ. For very few countries)

- Number of hours teachers are required to be at school to earn their Full-time salary

  OECD-Ed.Database, Indicator D3 (EaG) (Observ. For very few countries)

CURRENT AVAILABILITY

OECD Education Database – Network C data

- Number of classroom sessions per year by (and duration of one classroom session):
  - Subject matter:

  1. Compulsory Part: Mother tongue, mathematics, science, social studies, modern foreign languages, technology, Arts, physical education, religion, vocational skills, other.
  2. Flexible part.
     - Age group (9 to 14 years old)

- Full-time teacher teaching time (hours per day, per week, per annum; days per week, annum) by:
  - By Level of education (Pre-primary, primary, lower secondary, upper secondary);
  - By type of institution (private or public);
  - By type of educational programme: General or pre-vocational/vocational programmes.

- Concept of teacher "working time" applied:
  - Fixed working time requirements for full-time teachers;
  - No formal fixed working time for full-time teachers;
  - Local, school-level or individual agreements (no common full-time teacher concept).

2.8 Enrolment rates

338. Level of Detail: By age, level of education.

CURRENT AVAILABILITY

EDUCATION at a GLANCE 2000

- Enrolment rates by single year of age and level of education (Pre-primary, primary, lower secondary, upper secondary, Tertiary)

  OECD-Ed.Database, Indicator C1 (EaG-2000)

- Transition characteristics at each year of age from 17 to 20: Net enrolment by level of education.

  OECD-Ed.Database, Indicator C1 (EaG-2000)

- Distribution of Enrolment in upper secondary education by programme destination and programme orientation (General, Pre-Vocational, Vocational)

  OECD-Ed.Database, Indicator C2 (EaG-2000)

2.9 Retention Rates

339. Level of detail: By grade level, region of country, educational programme, type of institution.

2.10 Ending Age of Compulsory Education

CURRENT AVAILABILITY

Available in OECD Education database

2.11 Relative weight of different educational programmes

CURRENT AVAILABILITY

Available in OECD Education database, Enrolment by educational programme, see section 2.1.

2.12 Size of Private Sector

340. Level of detail: By grade level, region of country, educational programme.

See 2.1

2.13 General Economic Situation (Labour market conditions)

- Unemployment rates by age-range, gender, highest level of educational attainment.
- Returns to Schooling by age-range, gender, highest level of educational attainment.

CURRENT AVAILABILITY

EDUCATION at a GLANCE 2000

Unemployment rates by age-range and by highest level of educational attainment and gender.

OECD-Ed.Database, Indicator E1 (EaG-2000)

3. SUPPLY OF TEACHERS

3.1 Sources of Supply

- Reserve Pool of Qualified teachers: Experienced former teachers, *delayed* entrants
  - Potential supply of returnees;
  - Type of activity while not teaching;
  - Proportion of those that taught at some period and for how long they taught;
  - Time spent out of teaching for those that return to teaching;
  - Reasons for re-entering teaching;
  - Reasons for not entering teaching for those who are certified teachers;
  - Retrospective data that track new hires from the reserve pool backward, to study their career histories prior to entering or re-entering teaching.

  Level of detail: By subject area, region of country.
- Newly Certified teachers
  - Potential supply of new graduates;
  - Percentage of college students training to become teachers;
  - Proportion that applied for positions;

- Proportion that enter teaching;
- Reasons for entering the profession.

Level of detail: By subject area, region of country.

- Alternative Certification
  - Types of certification

Level of detail: By subject area, region of country.

- Private School teachers
  - Reasons for migrating to public sector.

Level of detail: By subject area, region of country.

3.2 Flows out of profession

- Attrition/Retention Rates

  Level of detail: By subject area, grade level, region of country, type of school, location of school, years of experience of teacher.

- Characteristics of Leavers

  Level of detail: By subject area, grade level, region of country, type of school, location of school, years of experience of teacher, academic ability of teacher.

- Reasons for Leaving the Teaching Profession

  Possibilities: School-staffing action, dissatisfaction, personal, to pursue other job, retirement.

  Level of detail: By subject area, grade level, region of country, type of school, location of school, years of experience of teacher, academic ability of teacher.

- Reasons for dissatisfaction

  Possibilities: Class sizes, Inadequate time, poor opportunity for advancement, poor student motivation, lack of faculty influence, student discipline problems, poor administrative support, poor salary.

  Level of detail: By subject area, grade level, region of country, type of school, location of school, years of experience of teacher, academic ability of teacher.

3.3 Incentives

Salaries

341. Level of detail: Starting, Maximum, after a specific number of years of experience, relative to GDP per capita, per teaching hour, relative to gross average earnings, relative to worker with same educational attainment, relative to worker with educational background in same subject area. Also by level of education, educational programme, type of institution.

CURRENT AVAILABILITY

OECD Education Database – Network C data

Teacher compensation by:

- By Level of education: pre-primary, primary, lower secondary, upper secondary.
- By type of educational programme: General or pre-vocational/vocational programmes.
- By Type of institution: private, public, or government dependent private.
- By teaching experience:
  - Starting teacher with minimum level of training;
  - Teacher with minimum level of training and 15 years of experience;
  - Teacher with minimum level of training at top of salary scale;
  - Teacher with maximum qualifications at top of salary scale;
  - Teacher with typical qualifications and 15 years of experience.

CURRENT AVAILABILITY

EDUCATION at a GLANCE 2000

OECD-Ed.Database, Indicator D1 (EaG-2000) - Statutory teachers salaries

By educational level (primary, lower secondary, upper secondary general programmes and vocational programmes)

- Starting Salary
- Maximum Salary
- Relative to GDP per capita
- Salary per teaching hour
- Relative to gross average earnings

  Relative to 10^{th}, 50^{th}, and 90^{th} percentiles of the overall distribution of gross annual earnings of full-time wage and salary workers.

- After a specific number of years (15 years of experience)

Career Structure

CURRENT AVAILABILITY

OECD Education Database – Network C data

- Years to grow from minimum to maximum salary by:
  - Level of education (pre-primary, primary, lower secondary, upper secondary);
  - Type of institution (public, government dependent private, independent private).
- Criteria for salary increments in public institutions:
  - Holding an initial educational qualification higher than the minimum qualification required to enter the teaching profession;
  - Reaching high scores in the qualification examination;
  - Holding an educational qualification in multiple subjects;
  - Successful completion of professional development activities;
  - Management responsibilities in addition to teaching duties;
  - Holding an higher than minimum level of teacher certification or training obtained during professional life;
  - Outstanding performance in teaching (for example based on higher student achievement, independent assessment of teaching skills, etc.);
  - Teaching courses in a particular field (for example mathematics or science);
  - Teaching students with special education needs;
  - Teaching more classes or hours than required by full-time contract;
  - Special activities (for example coaching, leading drama club, etc.);
  - Special tasks (for example teacher trainer);
  - Teaching in a disadvantaged, remote or high cost area;
  - Family status;
  - Age

CURRENT AVAILABILITY

EDUCATION at a GLANCE 2000

OECD-Ed.Database, Indicator D1 (EaG-2000) – Statutory teachers salaries

By educational level (primary, lower secondary, upper secondary general programmes and vocational programmes)

- Years from starting to top salary
- Ratio of maximum (or salary after 15 years of experience) salary to starting salary.

Existence of merit/differentiated pay schemes

342. Merit-based awards: structure of incentives, methods of evaluation, group evaluating, proportion obtaining merit awards, schools' experience with merit pay systems.

343. Differentiated pay schemes: subject areas targeted, other reasons for differentiation, structure of system, schools' experience.

Working conditions

- Number of classes taught, class size, teaching load;
- Percentage of class time outside area of certification;
- Flexibility to take leaves;
- Out-of-classroom activities;
- Safety of schools;
- Quality of facilities and instructional resources;
- Opportunities for collaboration and decision-making.

3.4 Teacher Training

- Availability of programmes
- Contents of programmes: Definition of standards, pedagogy/subject-matter coursework balance; amount of teacher testing, duration of programmes;
- Accreditation of educational programmes: Body responsible for it, conditions for accreditation, criteria for programme approval., holding teacher educational programmes accountable for results of teacher testing.

CURRENT AVAILABILITY

OECD Education Database – Network C data

- Pre-service training requirements for new teachers in public institutions by level of education (pre-primary, primary, lower secondary, upper secondary (general and vocational)):
  - Teacher qualification level;
  - Qualification to enter teacher training;
  - Course structure of pre-service teacher training (typical duration of subject specific studies, typical duration of pedagogical studies, typical duration of assisted teaching practice);
  - Total duration of teacher training;
  - Provider of training programme.

CURRENT AVAILABILITY

EDUCATION at a GLANCE 2000

Number of years of post-secondary education required to become a teacher by educational level (primary, lower secondary, upper secondary in general programmes)

OECD-Ed.Database, Indicator D2 (EaG)

3.5 Teacher Certification

- Licensure Procedures: Requiring subject matter major, requiring pedagogy coursework;
- Existence of a Teacher Examination
- Requirement of short teaching experience;
- Requirement of a graduate degree in education;
- "Emergency" Certification: alternative routes for certification.

4. STRUCTURE OF MARKETS

4.1 Government Intervention

Degree of Intervention by type of government

- Level of government at which different types of curriculum decisions (choice of text books, design of programmes, selection of programmes offered, range of subjects taught, definition of course content) are made in lower secondary education.

  OECD 1998 Survey on the Locus of Decision-making in Education, Indicator D6 (EaG-2000)

- Public Funds by Level of Government (Central, Regional, Local) by level of education (primary, secondary, tertiary).

  OECD-Ed.Database, Indicator B6 (EaG-2000)

Overall budget for education

CURRENT AVAILABILITY

OECD EDUCATION DATABASE

- Education expenditures by:
  - Level of Education:

1. Pre-primary (ISC 0)
2. Primary (ISC 1)
3. Lower Secondary (ISC 2)
4. Upper Secondary (ISC 3)
5. Post-Secondary, non-tertiary (ISC 4)
6. First-Stage of Tertiary Education (ISC 5, 5A and 5B)
7. Advanced Research Programmes (ISC 6)

CURRENT AVAILABILITY (Continuation)

OECD EDUCATION DATABASE

– By Source:

1. Central Government
2. Regional Government
3. Local Government
4. International Agencies
5. Private expenditures of households
6. Expenditures of other private entities

– By Type of transaction

1. Government expenditure: direct expenditure, scholarships, loans, transfers, etc.
2. Private expenditure: payments to educational institutions, other payments, financial aid for students.
3. International Agencies: Direct payments to institutions, Transfers to governments.

- Education expenditures by:

– Level of Education:

1. Pre-primary (ISC 0)
2. Primary (ISC 1)
3. Lower Secondary (ISC 2)
4. Upper Secondary (ISC 3)
5. Post-Secondary, non-tertiary (ISC 4)
6. First-Stage of Tertiary Education (ISC 5, 5A and 5B)
7. Advanced Research Programmes (ISC 6)

– By Nature and Resource Category:

1. Total expenditure for compensation of personnel.

✓Teachers (Salaries, pensions, non-salary benefits)

✓Other pedagogical, administrative, support personnel (Salaries, pensions, non-salary benefits).

2. Total expenditure other than for the compensation of personnel.
3. Total capital expenditure.

– By type of institution (private or public).

CURRENT AVAILABILITY

EDUCATION at a GLANCE 2000

- Expenditure on educational institutions at all levels of education combined as a percentage of GDP, by source of funds.

  OECD-Ed.Database, Indicator B1 (EaG)

- Public expenditure on education as a percentage of total public expenditure (non-tertiary, tertiary levels).

  OECD-Ed.Database, Indicator B1 (EaG)

- Annual expenditure per student in public and private institutions, by level of education (Early Childhood, Primary, Secondary, Tertiary).

  OECD-Ed.Database, Indicator B4 (EaG)

- Educational expenditure by resource category (current (compensation of teachers, compensation of other staff, compensation of all staff, other current expenditures) versus capital) for public and private institutions, by level of education (primary, secondary, tertiary)

  OECD-Ed.Database, Indicator B5 (EaG).

Most used policy tools

344. Areas covered: The organisation of schools; The introduction of market mechanisms; Teaching and Learning technologies; Teacher Recruitment Policies; Tools for the management of teacher demand; Tools for the management of teacher supply; The relationship with unions; The presence of private schools; The establishment of partnerships; The quality of facilities and instructional resources; The safety of school environment.

4.2 Market Mechanisms

- Extent of School Choice: Open Enrolment, Charter schools, school vouchers;
- Degree of competition for teachers by schools;
- Recruitment and promotion practices: criteria and processes.

4.3 Organisational Structure of Schools and degree of accountability

- Level of autonomy of schools

CURRENT AVAILABILITY

EDUCATION at a GLANCE 2000

– Distribution of responsibility for curricular and school organisation according to the principal's perceptions.

IEA/TIMSS, Indicator D6 (EaG-2000)

– Relationship between centralisation of public school funding and centralisation of educational decision-making (at the following levels: allocation of resources, personnel management, planning and structures, organisation of instruction) in lower secondary education.

OECD-Ed.Database, Indicator B6 (EaG-2000)

- Areas of authority: curriculum, budget, personnel, strategic planning.
- Constraints to authority
- Recipients of increased authority: principal, representative group.
- Resources devoted to management system
- Stated objectives of schools
- Degree of accountability

4.4 Teacher Unions

- Degree of unionisation

5. TEACHING QUALITY

5.1. TEACHER QUALITY

5.1.A. Teacher Education, Subject-matter preparation

345. See 3.4

5.1.B. Teacher Certification

346. See 3.5

5.1.C. Academic Tested ability of teachers

347. Transcript data on general intellectual activity, results of teacher examinations

5.1.D. Teacher Experience

348. See 1.1

5.1.E. Professional Development

- Type of activities: curriculum and performance standards, uses of educational technology for instruction (ICT), methods of teaching in specific subject field, in depth study in specific field, student assessment, co-operative learning in the classroom, working with special populations (culturally diverse students, students with limited proficiency in country's language, students with special needs), school management and leadership, classroom management, civic education, social and health education, remedial education, school guidance and counselling, pedagogical innovations, relationships with parents and community.
- Type of provider
- Type of setting for provision: workshops, conferences, summer institutes, courses at graduate level.

5.2. TEACHING ENVIRONMENT

5.2.1. TEACHING TECHNOLOGY

5.2.1.A. Class Size/Pupil-teacher ratios

349. See 2.6

5.2.1.B. Teaching and Learning Practices

- Team-teaching
- Use of ICT

CURRENT AVAILABILITY

EDUCATION at a GLANCE 2000

IEA/SITES, Indicator D7 (EaG-2000)

- Ratio of students to computers in lower secondary education, for schools with computers.
- Percentage of students in schools using computers with access to e-mail/Internet for instructional purposes, by level of education (primary, lower secondary, upper secondary).
- Percentage of teachers (from the grade range) and students (at the end of the target grade) who have used e-mail in lower secondary schools.

- Class Management

CURRENT AVAILABILITY

OECD Education Database – Network C data

Whether any of the following strategies of class management is used:

- Double shift classes/schools;
- Triple shift classes;
- Simultaneous teaching of different classes in the same room;
- Other strategies to deal with a high number of students and limited infrastructure;
- Multigrade teaching combining two levels in one class;
- Multigrade teaching combining more than two levels in one class;
- Boarding schools (students live at the school and do not go home in the evening).

- Interaction between teachers and Students
- Materials and Resources used in the classroom
- Nature of the learning tasks students perform in school and at home
- Methods for assessing student progress
- Attitudes towards teaching
- Time spent in classrooms
- Time spent preparation
- Time spent grading
- Time spent in other out-of-class activities

- Time spent in out-of-school activities
- Opportunities for collaboration and decision-making

5.2.1.C. Standards and Assessment Practices

- Requirements for graduation;
- Existence of examinations for graduation;
- Requirements for passing from one grade level to the next;
- Homework assignment;
- Tests assignments.

5.2.2 TEACHING ENVIRONMENT

5.2.2.A. Partnerships

- School-Community
- School-Business
- School-Family

5.2.2.B. Safety

5.2.2.C. Quality of Facilities

5.2.2.D. Internal Organisation of Schools

350. See 4.3

OECD EDUCATION WORKING PAPERS

The recent releases are:

No.2 TEACHER EDUCATION AND THE TEACHING CAREER IN AN ERA OF LIFELONG LEARNING (2002), John Coolahan

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