2.
Supply and Demand in Education: How Markets Allocate Scarce Resources

"At all times and places, that is dear which it is difficult to come at, or which it costs much labour to acquire; and that cheap which is to be had easily, or with very little labour."

Adam Smith, *The Wealth of Nations*

Introduction

In the country of Xylos, university education is highly prized. Graduates of the university system have earnings 80 percent higher on average than those of workers who are not university graduates. All universities in the country are publicly funded. There is no tuition. Indeed, students receive living subsidies from the government. Currently the 1,000 new places available each year in the country's university system are awarded to the 1,000 students who receive the highest scores on the national university entrance examination. Last year 9,000 students took the examinations. While this imbalance between supply of places (i.e., 1,000) in the university system and the demand for these places (i.e., 9,000) has prevailed for many years, the recently elected democratic government in Xylos is committed to change.

This session is devoted to developing tools that are helpful in considering options for tackling this and similar problems. We begin by developing an analytical framework. This session begins by describing the mechanisms that determine how prices and quantities are set in *competitive markets* (see definition of a competitive market below). Although the treatment is somewhat abstract, the basic lessons are helpful in understanding a variety of educational policy issues.

Most of the microeconomic tools you will learn today were developed by the English economist, Alfred Marshall (and are described in his 1890 text, *Principles of Economics*). Economists call these tools "supply and demand analysis." Keep in mind that Marshall developed the tools of microeconomics not as an intellectual game, but

rather because he saw them as valuable in predicting the consequences of events such as an increase in immigration, a massive crop failure, or technological advances such as the invention of better plows.

Supply and demand analysis examines the effect of a <u>single change</u>, <u>holding constant</u> the other factors that affect demand and supply (the *ceteris paribus* assumption)[1] in a given market.[2] While simple in its design, Marshall's framework is useful in analyzing the consequences of a variety of events. Supply and demand analysis is, seen from one perspective, very mechanical: A particular market, say the market for private secondary school education, starts off in equilibrium, meaning that at the market price, demand equals supply. Then, some event results in a shift of the demand curve or the supply curve. By figuring out which curve shifts, and in which direction, you can figure out how the event will affect the equilibrium quantity and the equilibrium price.

Competitive Markets

A market for a given good or service (e.g., private primary education) is said to be competitive if there is a sufficient number of independent buyers (i.e., families) and sellers (i.e., private primary schools) so that no individual buyer or seller can determine or influence the price of the good or service (i.e., the fees charged by private schools) on his/her own, that is, by buying or selling large number of units of the good or service. In other words, the price in a competitive market is the unintended result of the voluntary exchanges that take place in that market between buyers and sellers of the good or service.

More rigorously, our definition of a **competitive market** is one in which the following assumptions are fulfilled:

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[1] *Ceteris paribus* is a Latin expression for "all other things being equal." In other words, by keeping other factors unchanged or "other things equal," the analysis focuses on the effects or consequences of changes in only one variable at a time. For example, "an increase in the fees charged by secondary schools in Xenox will, *ceteris paribus*, reduce the number of students who want to enroll in secondary school in Xenox."
[2] The Marshallian framework is called "partial equilibrium analysis," because it does not take into account how changes in one market affect prices and quantities in other markets

Assumption 1: Output is homogeneous; there are no quality differences in the output provided by different producers.

Assumption 2: All consumers can purchase all of the commodity they want at the given market price, but no consumer can individually influence the market price.

Assumption 3: All producers can sell all of the output they care to produce at the given market price, but they cannot sell any output at a price above the market price.

There are no markets for educational services in which all of these assumptions are satisfied. Nonetheless, understanding how prices and quantities are determined in competitive markets provides valuable insights into the operation of markets for a variety of educational services.

Supply and Demand

At a mechanical level, it can be said that the market clearing price is determined by the interaction of demand and supply. The market clearing price is that price at which the total number of units demanded equals the total number of units supplied (e.g., the level of school fees at which the supply of school places equals the demand for primary education). However, to understand this abstract statement, it is necessary to look separately at the determinants of the quantity demanded and the quantity supplied. Let us turn first to analyzing demand.

Determinants of Demand

Consider the market for primary school education in the country of Xenox. In this fictional country, there is no variation in the quality of primary schools, nor are any schools more conveniently located than others. All primary schools are privately owned and operated. Families send their children to school only if they can pay the bill and if they view it as worthwhile. (To keep the example simple, assume that every family has one child and that this child is of the age to attend primary school.)

Question: Under these circumstances, how many families will desire a primary school place for their child?

The demand for places in primary school (represented by the symbol Q^D or 'quantity demanded' or 'number of primary school places demanded by families') will depend on a number of factors, including:

(a) The price schools charge (P_i). All other things being equal, the higher the price schools charge in Xenox, the lower the demand for primary school places in Xenox.

(b) The prices of other goods and services that are complements to private primary school education (P_j, $j = 1, 2, \ldots n$). The higher the price of complements, the lower the demand for primary school places. Examples of complements to primary school education might be uniforms, books, and transportation.

(c) The prices of other goods and services that are substitutes for private primary school education (P_j, $j = 1, 2, \ldots n$). The higher the price of substitutes in Xenox, the greater the demand for primary school places in that country. Examples of substitutes might be apprenticeships, if craftsmen charge families a particular fee for providing apprenticeships to older primary school students.

(d) The opportunity cost of children's time (OC)—i.e., the value of the child's time if the child were to work instead of going to school. The higher the opportunity cost of children's time, the lower the demand for primary school places.

(e) The number of families in the country (Pop). Assuming that all families have one child of primary school age, then the greater the number of families in a country, the higher the demand for primary school places.

(f) The distribution of income among the families in the country. Often the income distribution is summarized by the average income, call it Y^*, but, of course, it is really the whole distribution that matters. The higher the average income, the higher the demand for primary school places.

Economists normally describe the demand as:

$$Q_i^D = f\left(P_i, P_j, OC, Pop, Y^* \right)$$

All this means is that the quantity of good *i* demanded depends on (i.e., is a function of) the price of good *i*, the prices of complements to and substitutes for good *i*, the opportunity cost of children's time, the size of the population, and the distribution of family incomes in the country. Holding constant population, the distribution of income, the opportunity cost of children's time, and the prices of complements to good *i* and substitutes for good *i*, we would expect that more families would want to send a child to private school if the price were lower—i.e., *ceteris paribus*, a reduction in the fees of private primary schools in Xenox, will result in an increase in the demand for primary school places.

Figure 1. The Demand Curve.
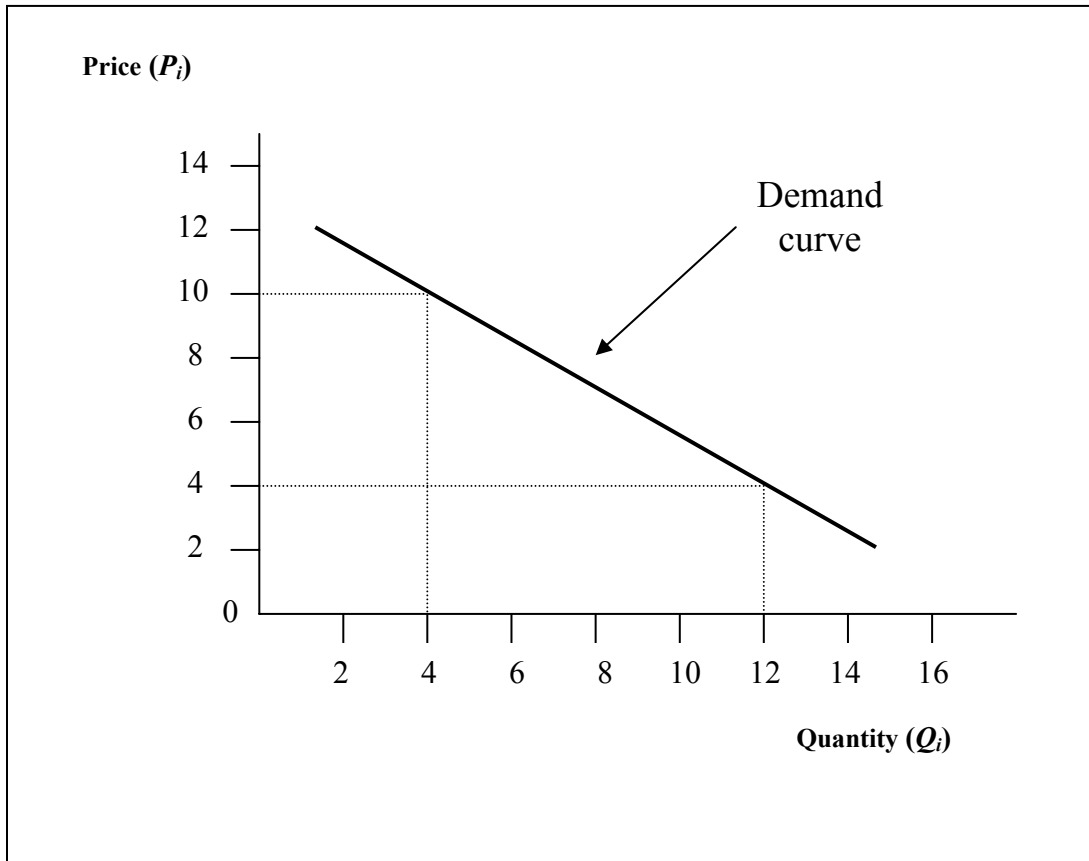
It is conventional to graph the market quantity demanded (Q_i^D) as a function of its own price (P_i) (*Figure 1*). Such a graph involves the *critical* assumption that the values of other variables affecting the quantity demanded, all P_j, Y, and *Pop*, remain unchanged. As mentioned above, this is called the *ceteris paribus* assumption (see footnote 1). *Figure 1* illustrates the relationship between Q_i^D and P_i for places in primary school. (Hint: It is important to understand the demand curve as an *if-then relationship*. It implies: <u>If</u> the price were 10, then four units would be demanded. If the price were four, then 12 units would be demanded.)

When carrying out an analysis, it is very important to distinguish between: (a) movements *along* the demand curve and (b) shifts *of* the demand curve.

(a) A change in the market price leads to a **movement *along* the demand curve**. Notice that the demand curve is downward sloping, implying that more of the good or service would be purchased if the price were lower (and less if the price were higher). Thus, for example, a reduction in school fees would lead to an increase in the quantity of school places demanded by families. In this case (that is, a change in market price) the demand curve itself will not move.

(b) A change in the price of substitutes or complements, in the opportunity cost of children's time, of the number of families in the country, and of the average income of the families, will all lead to **a shift *of* the demand curve**. The shift would be towards the right (indicating an increase in demand)[3] if the price of substitutes increases, or the price of complements decreases, or the opportunity cost of children's time decreases, or the number of families in the country increases, or the average income of families increases.
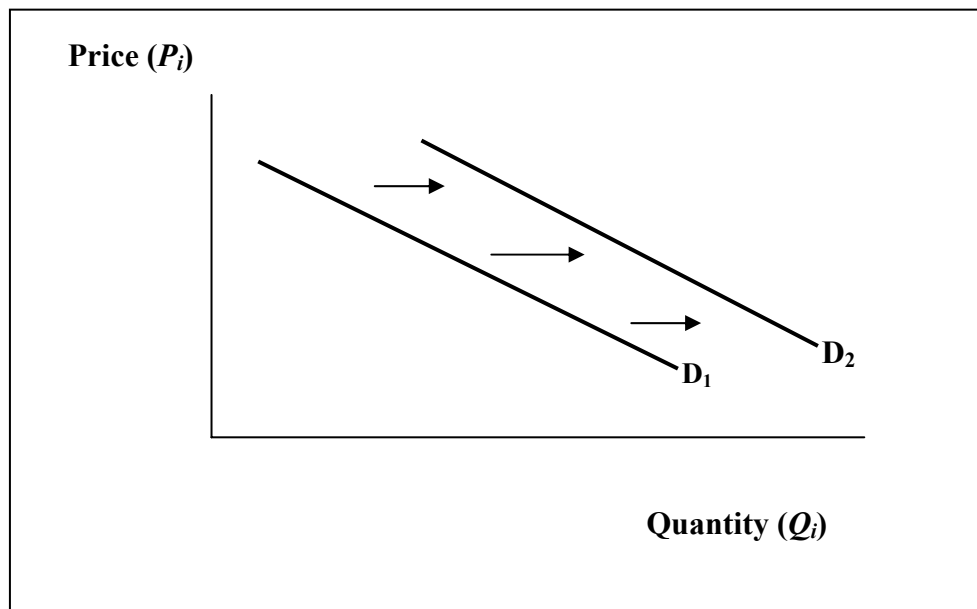
For example, we would expect that, ceteris paribus, an increase in population would result in an increase in the number of families that would want to send a child to primary school, simply because now there are more families in the country with primary age school children. In terms of a diagram relating quantity demanded to price, an

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[3] An increase in demand (i.e., a movement to the right of the demand curve) represents an increase in the quantity demanded at any given price.

increase in population <u>shifts</u> the demand curve to the right, indicating that with a larger population, more families would want to send a child to school at any given price (i.e., any given level of school fees). This is illustrated in *Figure 2*, where the increase in population results in a shift of the demand curve from D_1 to D_2.

Figure 2. An Upward Shift in Demand.

We would also expect that an increase in the incomes of all families would result in an increase in the number of families that would want to send their children to primary school at any given price, and holding population constant. Thus, an across-the-board increase in family incomes would also shift the demand curve from *AB* to *CD* in *Figure 2*.

We would expect that the movement of families from farms to urban areas would result in a shift of the demand curve from D_1 to D_2 in *Figure 2* because the opportunity cost of children's time would decline. (The logic here is that children are valuable workers on farms; they are of less value in urban areas.) Similarly we would expect that an increase in the price of apprenticeships would shift the demand curve from D_1 to D_2 in *Figure 2*.

In sum, demand analysis provides useful insights about the answers to questions such as "how many families will desire a primary school place for their child?" The analysis tells us that the demand for primary school places depends on the price of schooling, as well as on the price of substitutes and complements to schooling, the opportunity cost of children's time, the level of the population and the incomes of families.

Determinants of Supply

Remember that in Xenox there is a fully private (owned and managed) and perfectly competitive primary school market. Under these circumstances, how many places in primary schools will be supplied? (Notice that this question about primary education supply is just as important as the question about primary education demand. In fact, each question can be thought of as one blade of a pair of scissors. Just as you need both blades to cut with a pair of scissors, you need to understand the determinants of both demand and supply to predict the consequences on the number of students attending primary school of events such as immigration, and changes in agricultural techniques.)

Now consider the factors that determine how many places in primary schools will be <u>supplied</u> in Xenox. The supply of primary school places in Xenox (represented by the symbol Q_i^S or 'quantity supplied' or 'number of places available in primary schools') will depend on a number of factors, including:

a) The price paid by families for a year of primary school education (P_i). The higher the price, the higher the supply of primary school places.

b) The prices primary school owners must pay for inputs, including teachers, books, teaching materials, building rent, and so on (Prices of inputs). The higher the price of inputs, the lower the supply of primary school places.
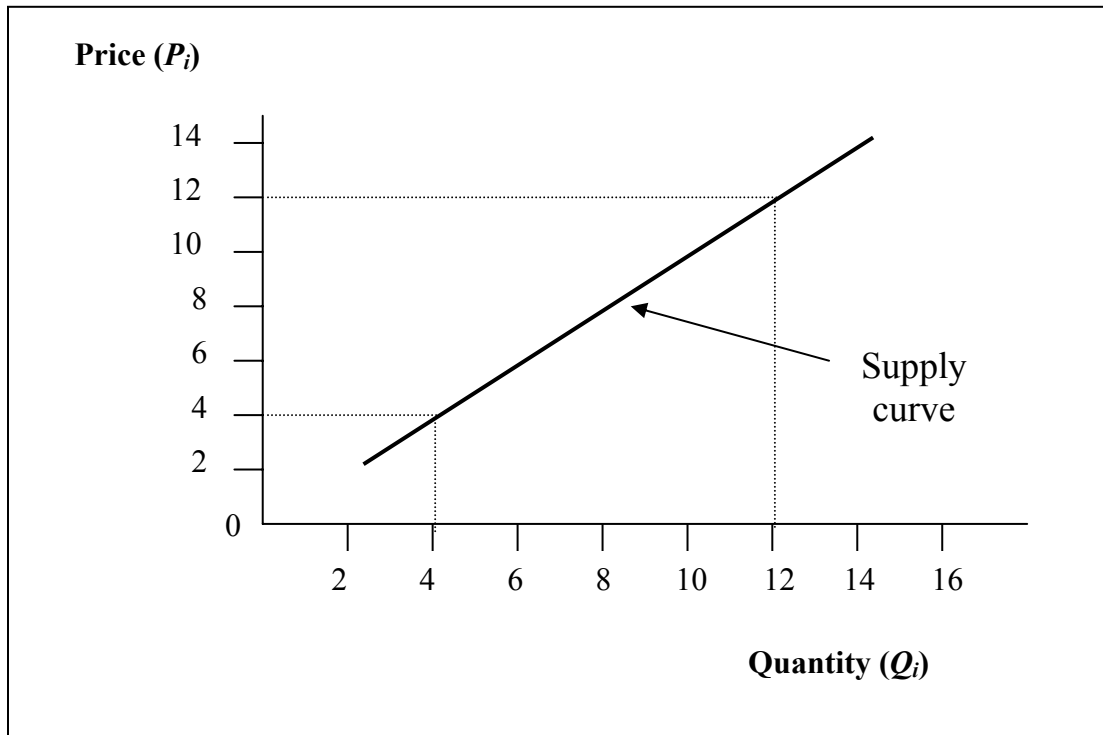
The supply can be expressed as:

$$Q^S = g \, (\, P_i \, , \textbf{Prices of inputs)}$$

(All that this equation means is that the quantity supplied depends on the price schools receive in fees for a year of primary school education and the prices the owners of primary schools must pay for inputs.)

Figure 3. The Supply Curve.

Holding constant the prices of inputs, we would expect that the owners of primary schools, as a group, would provide more primary school places the higher the price families were willing to pay. In other words, ceteris paribus, an increase in the price (fees) of primary school will lead to an increase in the number of primary school places available in Xenox. (Note that if the price is high enough, some educational entrepreneurs would start new private schools.) This positive relationship between quantity supplied and price is displayed in *Figure 3*.

We would also expect that if the price of a key input rose (for example, an increase in teachers' salaries, i.e., the school had to pay more to attract qualified teachers), it would provide a given level of places only if families were willing to pay a higher price for a year of primary school education. Thus, the increase in the price of an

input results, ceteris paribus, in a reduction of the supply of school places. This is illustrated in *Figure 4* as a shift (upward or to the left) in the supply curve (from *XY* to *VW*).

Figure 4. A Downward Shift in Supply.
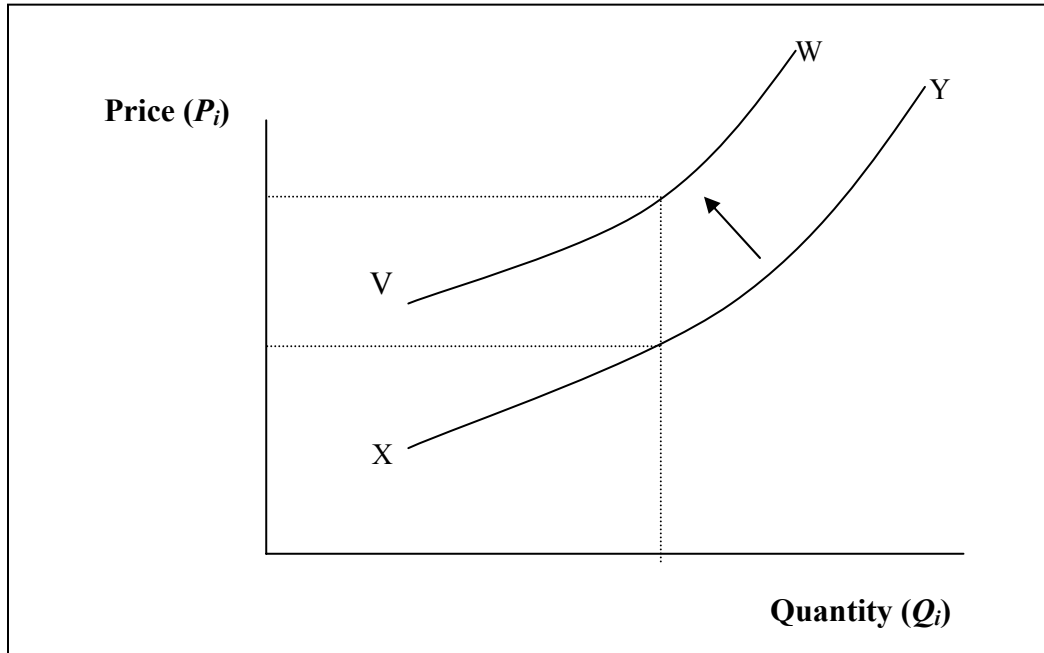
Equilibrium Price and Quantity

The **equilibrium price**, P_e, is that price at which the market demand Q^D, is equal to the market supply, Q^S. But market supply and demand are not always in equilibrium. A situation in which the prevailing price is below the equilibrium price is called **excess demand**, since at this price the demand for places in primary schools exceeds the supply of places. On the other hand, when at the prevailing price is above the equilibrium price, the supply of primary school places exceeds the demand for primary school places, and we speak of **excess supply**.

As illustrated in *Figure 5*, at any price below P_e, for example P_1, there is *excess demand* (often called a shortage). In other words, the number of units of the good

demanded at that price, Q_1^D, is greater than the number of units supplied, Q_1^S. This creates pressures for a price increase.

The exact mechanism that leads to the price increase varies from market to market. In some cases, the adjustment process is very rapid, and the price changes within minutes. The market for stocks on the New York stock exchange exhibits such rapid price adjustments. In other cases, the adjustment process is very slow, as in the case of markets for public school teachers.

At any price above P_e, for example P_2, the number of units supplied, Q_2^S, is greater than the number of units demanded, Q_2^D. In such situations of *excess supply* (or glut), pressures develop for the price of the commodity to fall.

Figure 5. Supply and Demand.
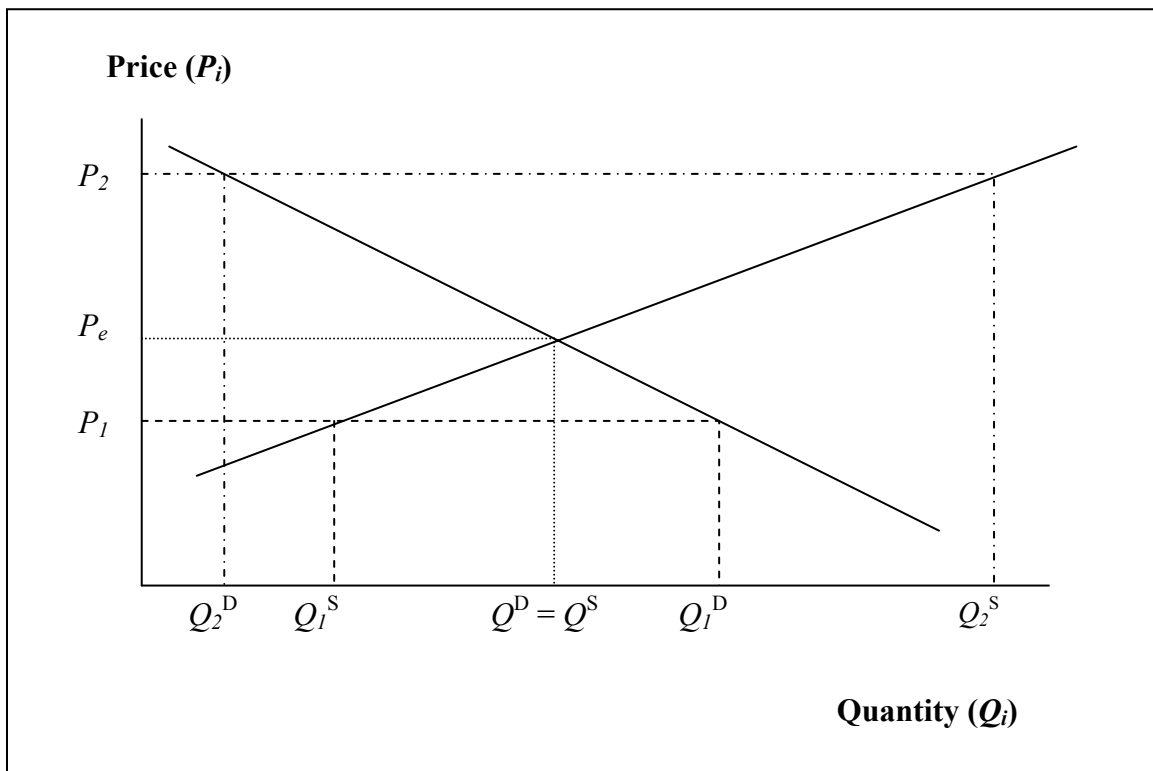
It is important to remember that at the equilibrium price, there is neither a shortage nor a glut. An implication is that when you see media reports of a shortage (for example, of places in a popular training program), it is worth asking why the price charged for the program does not rise. Often you learn that there are pressures for price adjustments, but that in a given particular market adjustments occur slowly. In some cases there are institutional factors, such as government regulations or union contracts, that contribute to the slow pace with which markets adjust to disequilibria.

Why Do Situations of Disequilibrium Arise?

The answer is that an event takes place that results in an increase in demand or supply, shown graphically by a <u>shift</u> in either the demand curve or the supply curve. The supply and demand analysis tools are concerned with: (a) whether the event results in a shift in the demand curve or the supply curve, (b) determining the direction of the shift, (c) determining whether the new equilibrium price will be lower or higher than the old equilibrium price, and (d) whether the new equilibrium quantity will be lower or higher than the old equilibrium quantity.

When some event shifts a supply or demand curve, the equilibrium in the market changes. The analysis of such a change is called *comparative statics*, because it involves comparing two unchanging situations—an initial and a new equilibrium. Comparative statics often involves geometric analysis of the intersection of supply and demand curves, and when mathematical expressions for the demand and supply relationships are given, it is also possible to calculate numerical values for the changes in *P* and *Q*.

Working with Explicit Demand and Supply Functions

In order to understand comparative statics, it is useful to employ some elementary algebra. Let us practice the algebra of determining the equilibrium price for a year's education at a primary school in Xenox, given algebraic expressions for the demand for this service, Q^D, and the supply, Q^S.

Assume: $Q^D = 25,000,000 - 16,000P$

                          $Q^S = 7,200,000 + 1,800P$

Solve for the equilibrium price and quantity. Note that these expressions assume that the other factors that influence demand and supply are held constant.

In equilibrium, $Q^D = Q^S$

Therefore $25,000,000 - 16,000P = 7,200,000 + 1,800P$

Solve for P. $P = \$1,000$.

To find the equilibrium quantity, substitute $P = 1000$ into either the demand equation or the supply equation. $Q = 9,000,000$ students.

This equilibrium is illustrated in *Figure 6*.

If the price were $1,100, by how much would supply exceed demand?
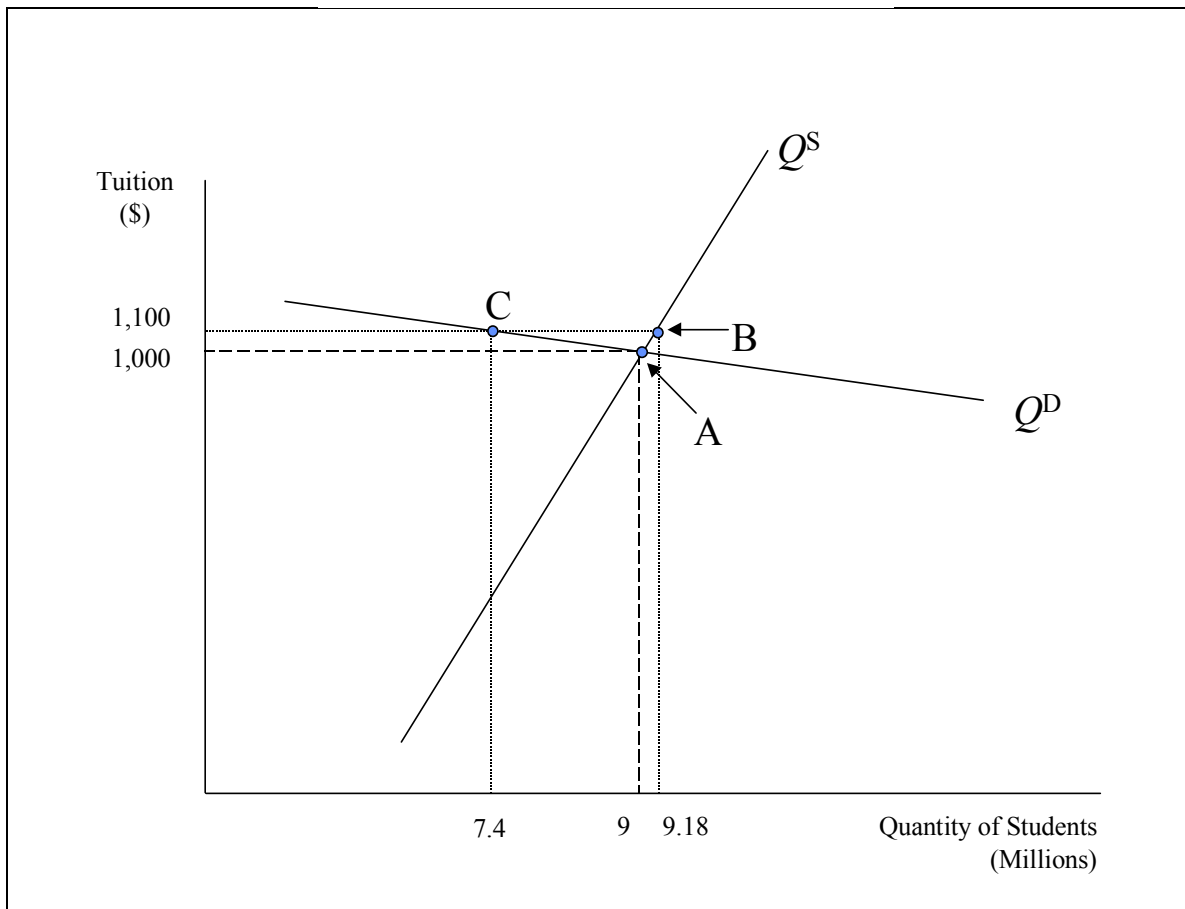
At $P = \$1,100$, $Q^S = 7,200,000 + 1,800(1,100)$

$Q^S = 9,180,000$

At $P = \$1,100$, $Q^D = 25,000,000 - 16,000(1,100)$

$Q^D = 7,400,000$

Thus at $P = \$1,100$, the quantity supplied exceeds the quantity demanded by 1,780,000 students.

Figure 6. Equilibrium.

Practice Exercise: The Private Secondary Schools Market in Xenox

To practice your skills with demand and supply analysis, consider the market for private secondary schools in Xenox. Assume, as before, that all secondary schools are of equal quality (and, because of competition among them, must charge the same price). Thus, there is one market clearing price, P_e. Q_e is the number of students served at this equilibrium price. *Figure 7* illustrates the original equilibrium price, P_1, and quantity, Q_1.

Now consider the impact on the market of each of the following events, but remember that in doing supply and demand analysis, it is important to always assume that the market starts out in equilibrium before the event or "disturbance" occurs.[4]

Figure 7. The Private Secondary Schools Market in Xenox.
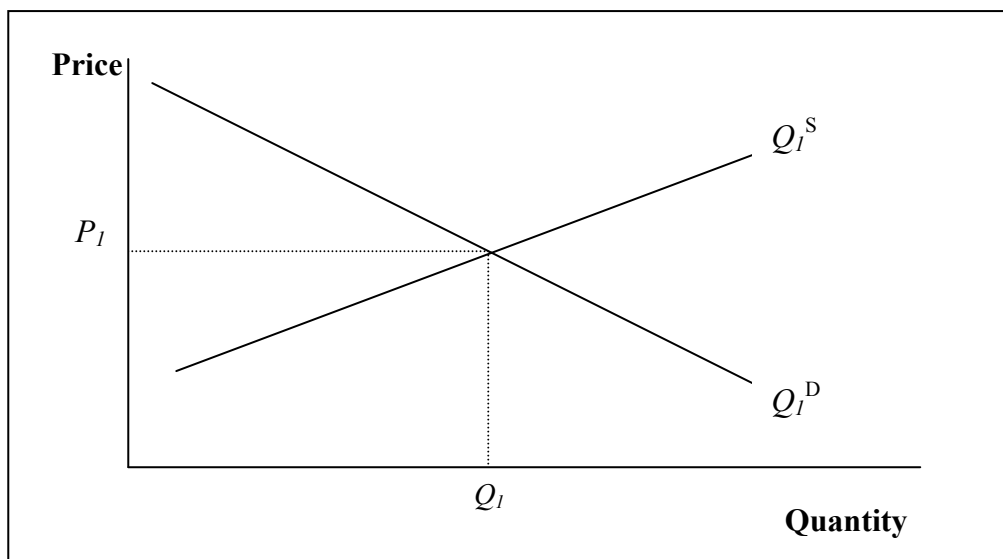
1. <u>A quarter of the nation's secondary school teachers emigrate</u>. This will force private secondary schools in Xenox to pay more for a key input–teachers. The emigration shifts the supply curve of schools to the left, to $Q_2{}^S$, as shown in *Figure 8*. As a result, the tuition (price) rises from P_1 to P_2, and the number of students served falls from Q_1 to Q_2.

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[4] Remember also that it is always necessary to assume that only the influential factor under analysis changes but that all other influences on demand and supply do not change. This is the *ceteris paribus* assumption (see footnote 1).

**Figure 8. Emigration of Secondary School Teachers.**
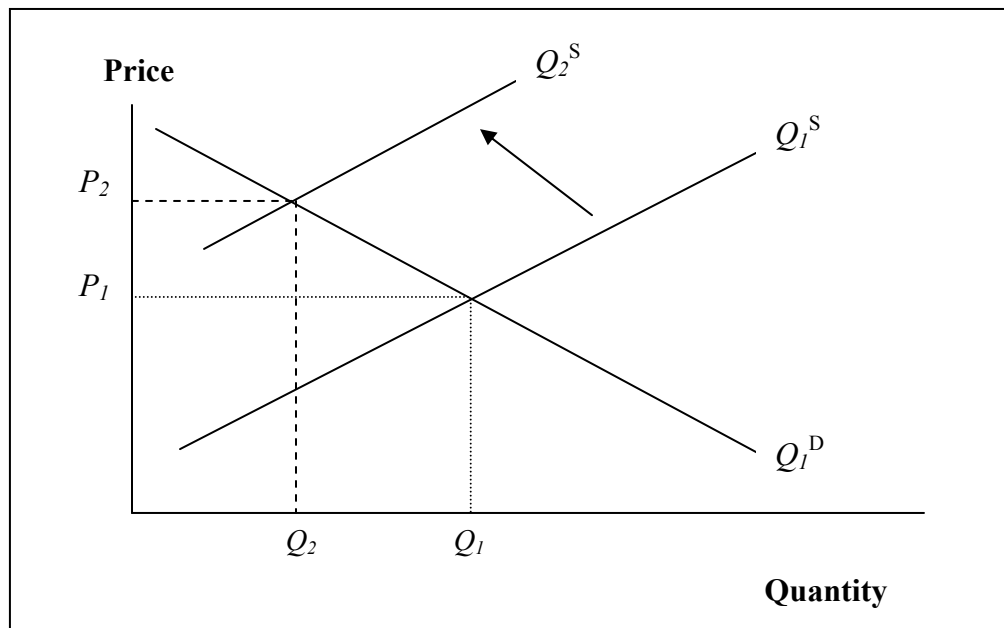
2. <u>An increase in the incomes of all families due to economic growth</u>. This will increase the number of families that want to send their children to secondary schools at any given fee level. This will shift the demand curve to the right (from Q_1^D to Q_2^D in *Figure 9*). The result is an increase in both *P* and *Q*.

3. <u>The price of apprenticeships increases</u>. Because apprenticeships are substitutes for secondary school education, this will shift the demand curve for secondary schools to the right, as in *Figure 9*.

4. <u>The price of school uniforms declines</u>. In Xenox families are responsible for purchasing the uniforms that secondary students are required to wear. A decline in the price of uniforms (a complement to secondary schooling) shifts the demand curve for secondary schools to the right, resulting in an increase in the price of secondary schools and an increase in the number of students attending secondary schools (*Figure 9*).

Figure 9. Increase in Income or Increase in Price of Substitutes or Reduction in Price of Complements or New Tuition Tax Credit.
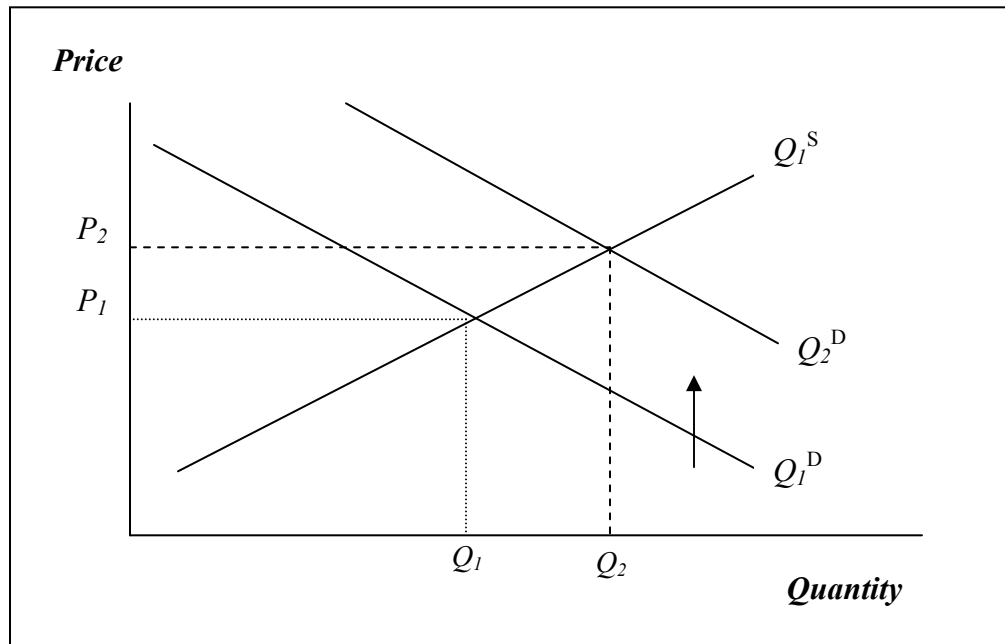
5. <u>A tuition tax credit is passed that permits families that send their children to private secondary schools to deduct \$250 from their income taxes</u>. Tuition tax credits shift the demand curve to the right, as in *Figure 9*. The logic is that families that want to send their children to secondary school, but were not willing to pay a tuition of P_1 before the tuition tax credit was introduced, are now willing to do so because the <u>net price</u> is the tuition price minus the credit. Notice that, as drawn, the effect of tuition tax credits is to increase the number of children attending secondary schools (from Q_1 to Q_2) <u>*and*</u> to increase the equilibrium price of secondary schools from P_1 to P_2.

It should be easy to see that the related sizes of the quantity increase and the price increase depend on the slope of the supply curve and the slope of the demand curve. For example, if the supply curve is horizontal, then the effect of tuition tax credits is to increase Q, but not P (See *Figure 10*). Think about the interpretation of a horizontal supply curve.

Figure 10. Horizontal Supply Curve.
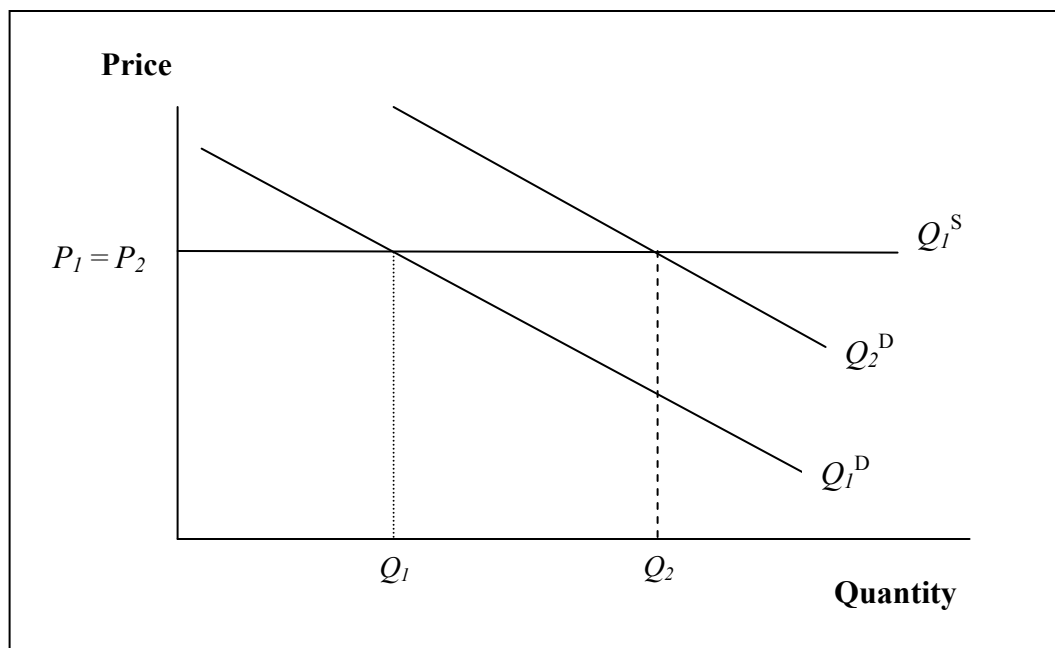
If the supply curve is vertical, then the effect of tuition tax credits is to increase P, but not *Q* (see *Figure 11*). What is the interpretation of a vertical supply curve?

The slope of the supply curve is really conveying information about how *responsive* the quantity supplied is to changes in price. The slope of the demand curve conveys information about how *responsive* the quantity demanded is to price. Given the importance of the degree of responsiveness of demand and supply to changes in price, it is important to measure such responsiveness carefully. The next class focuses on *elasticity*, the concept economists use to measure responsiveness.

In a later class we will explore how the 1997 passage by the U.S. Congress of Hope Scholarship Credits affects the demand for post-secondary education in the United States. This legislation provides a income tax credit for qualified tuition and related expenses paid for a student's first two years of post-secondary education at an eligible educational institution. Subject to "phaseout" for higher-income taxpayers (the reduction in benefit begins at an income of $80,000 for a joint return and provides no benefits for families filing a joint return of $100,000 or more,) the credit is equal to 100%

of the first $1,000 of qualified expenses paid during the year plus 50% of the next $1,000 of expenses (maximum credit of $1,500). The qualified expenses must be incurred on behalf of the taxpayer, the taxpayer's spouse, or a dependent. The credit is not refundable, meaning that it provides benefits only to taxpayers with positive income tax liability. (No taxpayer receives a refund check as a result of claiming the tax credit.)

Figure 11. Vertical Supply Curve.
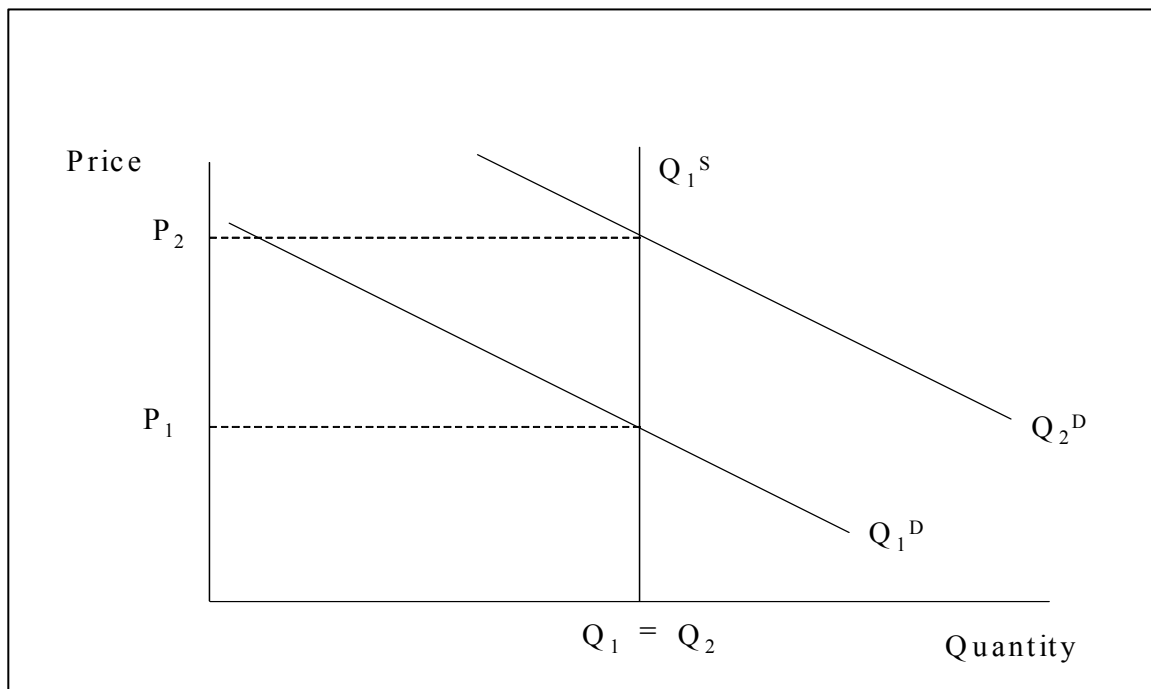
Exercise: Allocating Primary Education in a Developing Country

Country A is a small, low income country. Initially, the country had only private primary schools. (For the purpose of this exercise, assume that all of the primary schools were of equal quality and charged the same price, the market clearing price.) The demand in country A for primary education (of the quality that prevailed) is:

$Q^D = 10,000 - 100P$

where: Q^D = the number of students
                         P = tuition, expressed in dollars.

To keep the problem simple, assume initially that supply is fixed at 6,000 places in primary schools. This might be justified by the assumption that there are 150 qualified primary school teachers in the country and it has long been "accepted practice" to have 40 students in each primary school class.

Question: What is the equilibrium price of primary school tuition?

Answer:

Set $Q^D = Q^S$, where $Q^S = 6000$
10,000 - 100P = 6000
100P = 4000
P = \$40   (This equilibrium is displayed in *Figure 12*.)

Figure 12. Equilibrium Price of Primary School Tuition in Country A.
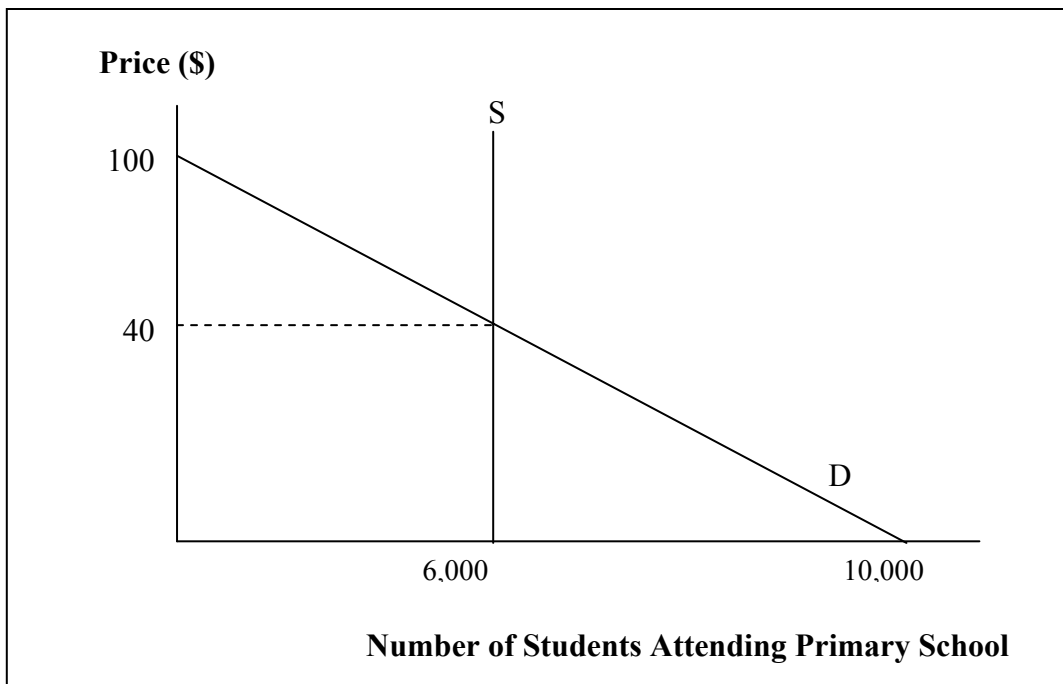
As you might expect, it was primarily affluent families that paid the \$40 tuition to send their children to school. Now a new government comes to power that is committed to making primary education more available to the poor. (To keep the

problem simple, assume that the government nationalized the private schools and continued to pay teachers their former salaries.

One strategy that the government is considering adopting to make education more accessible is to lower the price to $0. In other words, to make primary education free for all.

Question: At the $0 price, what will the level of demand be?

Answer:

$Q^D = 10,000 - 100(0)$

$Q^D = 10,000$

Thus, setting a $0 price creates a problem of an excess demand of 4,000 students.

Please read the article from the January 7, 2003 *New York Times* that follows these notes. The article describes the consequences of eliminating school fees in Kenya.

What strategies might the government use to cope with this situation of excess demand? Clearly, one long run strategy is to build more schools, and either train more teachers or import them. However, this strategy takes time; moreover, it is expensive.

Nationalization requires that the government take $240,000 from its budget just to cover the costs of teachers' salaries and school maintenance, costs that had been borne by the families that paid tuition under the previous regime. How might the government deal with the excess demand problem in the short run under the assumptions that the supply of teachers cannot be expanded and the government cannot increase its education budget beyond the $240,000 cost of absorbing the lost tuition fees?

1.   One strategy the government could adopt to allocate the scarce school places available is simply to say "first come-first served." In other words, the schools would take the first 6,000 students who applied. It is likely that this strategy would not last long. One reason is that it would lead to long lines of people waiting to register their children. Such long lines lower morale and result in productivity losses–workers don't get much accomplished in their jobs if their non-work hours are spent standing in line. A second reason this strategy would probably not last long is that it is subject to

corruption. Wealthy families could bribe enrollment officers or pay "representatives" to keep a place in line for them.

2.   A second possible strategy is to administer an <u>admissions test</u> and accept the 6,000 applicants with the highest scores. A criticism often levied against this strategy is that it is less meritocratic than it appears because affluent families can hire tutors to prepare their children for the test. To the extent that this is true, then setting the $0 price and admitting the highest scoring applicants can be a policy that ultimately uses tax dollars to subsidize the affluent. This is the conclusion of a 1986 World Bank paper entitled *Financing Education in Developing Countries* concerning the common practice in developing countries of providing free university education to the applicants who score highest on admission tests.

This theme is highlighted in a 1996 World Bank report on education financing in Vietnam. Admission to the country's 65 universities is by exam. For those admitted, the costs of attendance are extremely low because most costs are paid by government. Thus, the system seems extremely meritocratic. However, an analysis of attendance patterns shows that families at the top of the income distribution are the primary beneficiaries of the government higher education subsidies. Seven percent of families in the top (first) quintile of the income distribution have a child attending a university.   The corresponding enrollment rates for families in the other quintiles are as follows: 1.9% for second quintile; 1.0% for third quintile; 0.4% for fourth quintile, and 0% for the lowest quintile.

3.   A third strategy for allocating the available places in country A's primary schools is to conduct a lottery, and use a random drawing to distribute "<u>vouchers</u>" or "<u>ration coupons</u>" entitling the winners to a free primary education. A key decision in implementing this strategy is whether to make the vouchers non-transferable, or whether to permit winners to sell their vouchers to the highest bidder. The advantage of the non-transferable option is that it will result in some children from low-income

families attending school. One disadvantage is that it invites fraud, such as selling the vouchers illegally and sending children to school under false names. The incidence of such fraud can be controlled, but not without the use of real resources paid for out of the government budget.

Another disadvantage of making the vouchers non-transferable is that it is very difficult to know how many vouchers to distribute. For example, if every family with children of school age is given an equal chance of winning a voucher, some vouchers will go to families that will not send their children to school even with a voucher covering tuition cost because they need the children to help at home. If only 6,000 vouchers are distributed, and if those going to families that will not use them cannot be sold, then schools will be undersubscribed. Thus, to increase the probability that all 6,000 places in schools would be filled, the government must estimate the proportion of vouchers that will not be used. As directors of admission at United States colleges have learned, predicting acceptance rates is very difficult, and bad luck results in either empty seats or a newly admitted class larger than anticipated or desired. Presumably, colleges make admission non-transferable for reasons similar to those a government might have–namely, concern about who gets the education.

One advantage of making the vouchers transferable is that the poor who do sell their vouchers will at least have the money even if their children do not have the education. Thus, the program in effect will have a significant income redistribution aspect.

> ✎ Question: What is the market price of a tuition voucher likely to be? Why?

4. Another option is to let <u>class size increase</u> so that all children who desire primary schooling are accommodated. Using our numerical example, a first estimate is that class size would increase to 67 students. In fact, however, the

actual average class size might be less because the reduction in quality associated with larger classes might shift the demand curve to the left. (At this time very little is known about how sensitive the demand for primary education is to educational quality.) This strategy of increasing class size and spreading resources thinly in order to accommodate all students is quite common in developing countries, as the articles at the end of this set of notes illustrate. (Come to class prepared to discuss these articles.)

The practice of spreading resources thinly may well contribute to the high retention-in-grade rate and dropout rate that plague primary education in many countries.

The *key lesson* from this example is that if the market mechanism is not used to equate supply and demand, then some other rationing mechanism must be used. In evaluating the attractiveness of a policy that *sets price* below the market determined price, it is important to think carefully about the consequences of alternative rationing mechanisms.

One variant on the use of markets to equate supply and demand is to charge different families different prices for the same education. Economists call this practice *price discrimination*. College recruitment officers call it *scholarship aid*.

The normative defense of this practice is that if affluent families are charged a high price for education, the revenue received can be used either to subsidize the cost of educating children from low income families, or to expand the supply of education. The challenge in implementing such a policy is to find a characteristic of families that accurately predicts their ability to pay. Notice that families have an incentive under such a system to appear less affluent than they are–that is, to conceal or distort the information used to identify families willing to pay a high price for education.

Some Lessons Learned

The equilibrium price is that price at which the quantity demanded is equal to the quantity supplied. If you see reports in the media of a shortage of a particular good, it is worth asking why the price does not adjust to a new equilibrium. Often there are pressures but they act slowly in some markets.

If price is not used to ration scarce commodities or services, the problem of scarcity must be resolved by some other rationing mechanism. It is important to think through what the alternative rationing mechanisms are and what the consequences associated with alternative rationing mechanisms are.

In Africa, Free Schools Feed a Different Hunger

October 24, 2004
 By CELIA W. DUGGER

MALINDI, Kenya - More than 200 first graders, many of them barefoot, clothed in rags and dizzy with hunger, stream into Rebecca Mwanyonyo's classroom each day. Squeezed together on the concrete floor, they sit hip to hip, jostling for space, wildly waving their hands to get her to call on them. Their laps and the floor are their only desks.

One recent afternoon, the line of wiggly children waiting to have Mrs. Mwanyonyo check their work snaked around the bare, unfinished classroom walls. Girls and boys crowded around her, pressing their notebooks on her. Some cut in line. Fights broke out. Boys wrestled. Girls dashed from the room. Giggles and shrieks drowned out her soft voice.

Mrs. Mwanyonyo pulled a boy in front of her and eyed his attempt to list his numbers. "Can you write 1 and 2?" she asked quietly. His head sank to his chest as he shook it no. While she laboriously graded each child's work, the noise level rose to deafening. "Quiet, keep quiet!" she shouted, her voice on the edge of desperation.

Overnight, more than a million additional children showed up for school last year when Kenya's newly elected government abolished fees that had been prohibitively high for many parents, about $16 a year. Many classrooms are now bulging with the country's most disadvantaged children.

Kenya is not alone. Responding to popular demand for education, it is one of a raft of African nations contending with both a wondrous opportunity and nettlesome challenge: teaching the millions of children who have poured into schools as country after country - from Malawi and Lesotho to Uganda and Tanzania - has suddenly made primary education free. Mozambique will join them in January when it abolishes fees.

The explosion in enrollments has put enormous pressure on overburdened, often ill-managed education systems. What hangs in the balance is the future of a generation of African children desperately reaching out for learning as a lifeline from poverty, even as poverty itself presents a fearsome obstacle.

Near the end of a school year that runs from January to November, Mrs. Mwanyonyo, an earnest wisp of a woman, is still struggling to teach most of her students the alphabet and basic counting. She knows the names of only half of them. She estimated that 100 of her 250 students – split into morning and afternoon shifts - would have to repeat the grade. Salama Kazungu, a willowy girl of 12, sits among Mrs.Mwanyonyo's multitudes, her small shapely head rising above those of the 6- and 7-year-olds. She failed last year in the class of another first grade teacher who had 248 pupils. ("If I could have, I would have run away," the teacher confided, relieved he has just 110 pupils this year.)

Not Enough to Eat

It is hard for Salama to learn because her belly is often empty. Her mother sells charcoal but makes too little to buy enough food. Salama never eats breakfast. For supper, she often has only boiled greens foraged from the wild. On her hungriest days, the child said, she looks at Mrs.Mwanyonyo and sees only darkness. She listens, but hears only a howling in her ears. Yet she is determined to continue. At 12, she has already had her fill of the African woman's lot: fetching water, collecting firewood and carrying it to market on her back like a beast of burden.

"I was always working and working," she said. "I told myself that the best way to get out of this is to come to school and get an education."

In large measure, the idea of free education has gained powerful momentum because politicians in democratizing African nations have found it a great vote-getter. Deepening poverty had meant even small annual school fees -less than an American family would spend on a single fast-food meal - had put education beyond reach for millions. The abolition of school fees is also owed to the changing politics o f international aid. In the 1990's, the World Bank, the largest financier of antipoverty programs in developing countries, encouraged the collection of textbook fees. Its experts had reasoned that poor African countries often paid teacher salaries but allotted little or nothing for books. If parents did not buy them, there often were none.

But evidence began to mount that fees for books, tuition, building funds and other purposes posed an insurmountable barrier for the very poor. In 1996, Uganda's newly elected president, Yoweri Museveni, abolished fees for four children per family. His message that education was free sounded through the country like a clanging school bell. In 1997, 2.3 million additional children showed up for class, nearly doubling enrollment to 5.7 million.

Then in 2000, world leaders met in New York and agreed on an agenda to reduce global poverty, setting as one of the main goals that every child should be able to complete an elementary education by 2015. That same year, Congress, lobbied by advocacy groups for the poor, adopted legislation requiring that the United States oppose World Bank loans conditioned on user fees in education. In 2002, the World Bank, already supporting several free education initiatives, officially reversed its policy, deciding to oppose all such fees.

The tide had turned.

"In sub-Saharan Africa, almost all countries are under pressure to abolish school fees for primary education," said Cream Wright, education chief for the United Nations Children's Fund. "It will spread, especially if we show it works."

The track record is mixed.

Malawi's decade-old, underfunded and largely unplanned experiment is generally regarded as a disaster. The number of children in a first-grade class averages 100. Four out of ten of first graders repeat the year. Children's achievement scores are

among the lowest in Africa. Uganda, often held up as a model, also found that achievement fell as classes swelled with highly disadvantaged students.

But in the past eight years, donors have invested more than $350 million and the government also increased spending. Test results from last year show that achievement bounced back, though more than half of third graders still performed poorly in math and English.

Quantity Versus Quality

Some experts worry that the drive to expand enrollment rapidly has overshadowed the push for quality. "Just herding kids into classes and counting that as education hasn't worked," said William Easterly, an economics professor at New York University who was a research economist at the World Bank for more than a decade.

Even those immersed in the basic issues of achieving universal primary education acknowledge the challenges. "You can get kids into school," said Paud Murphy, who recently retired as one of the World Bank's lead education specialists, "but keeping them there and making them learn involves a whole lot more than we've understood."

The students at Gahaleni Primary School, more than 900 strong, gathered for morning assembly under the spreading arms of cashew nut trees, their voices rising through the branches in sweet song. But the moment of grace was shattered when the teacher in charge, Andrew Ngundi, ordered all children not wearing uniforms to come stand before the rest of the school. As part of its free education initiative, the government prohibited the expulsion of students who cannot afford uniforms - required for students in many African countries - but the new rule has not stopped administrators from pressuring poor children to get them. "How come you're sitting there and you still don't have a uniform," Mr. Ngundi said sharply, pointing at a boy who was frozen in place.

Slowly, barefoot children in torn, filthy T-shirts and hand-me-down dresses with broken zippers separated themselves from students neatly dressed in orange shirts and green shorts or skirts. Salama quietly slipped behind some taller students, hiding her shame - a skirt covered with big blowsy flowers she had bought used for about a quarter with her firewood earnings.

But Selina Malungu, a fatherless 8-year-old, stood before all her classmates in a grimy, red party dress adorned with torn lace and gay little bears climbing trees. It was her only outfit. The other children mock her for looking like a street urchin, she said. The lack of a $4 uniform is one of the many miseries poor children endure. Still, they persist. Boys and girls interviewed at two schools here in this district hugging the Indian Ocean voiced a simple faith that an education will make it possible for them to get decent jobs. They have only to look at their parents to see the alternative.

Twelve-year-old Asha Charo's mother, Kadzo Menza, a gaunt woman abandoned by her husband, makes 50 cents a day swinging a hammer to break rocks into small stones, a common building material. "I'll break stones until she gets an education," said Mrs.

Menza, who never herself got the chance to study. "When she finishes school and gets a job, I will rest."

The free education initiative has sent expectations soaring. It was only in the election of December 2002 that Kenya emerged from almost a quarter century of autocratic rule under President Daniel arap Moi, who nurtured corruption and bequeathed rising poverty to his people.

One of the first acts of the new president, Mwai Kibaki - chosen in Kenya's first elected change of government since independence from Britain in 1963 - was to abolish fees, fulfilling a promise he had made to cheering throngs as he campaigned across this country of 31 million people. But the government is still struggling to turn around an economy plagued by high unemployment and low growth so it can begin producing jobs for the children it is educating.

And it has only begun to change an education system where teachers too often face classrooms filled with too many children. Asha, who breaks stones each morning with her mother, is currently struggling in Mrs. Mwanyonyo's afternoon class
for more than 130 of the slower learners. The school has heard it may get one more teacher - it now has 9 for 954 students - but none have come yet to relieve Mrs. Mwanyonyo.

Worried about her inability to give students enough individual attention, Mrs. Mwanyonyo earlier this year removed her own 7-year-old daughter from the first-grade class she teaches and used some of her modest salary to send her to private school.

"Nobody can really teach such a mob of children," said the headmaster of her school, Andrew Thoya Muraba. "But what can we do when we are told by the government that the ministry has no money to employ teachers?"

Up to now, Kenya has not hired more teachers, though the country has an estimated 50,000 unemployed teachers and enrollment has surged to 7.2 million this year from 5.9 million in 2002.

A Broader Problem

Kenya actually has a decent average ratio of one teacher for each 39 students, but its schools suffer from a severely unequal distribution of teachers. Education Minister George Saitoti said in an interview that there were pockets of extremely large classes, but a 2004 spending review by the Kenyan government identified a more pervasive problem. It found "vast differences" in the staffing of schools within districts, as well as significant regional imbalances.

Here in the Malindi district, the most crowded in the nation, the teacher to student ratio among the 100 schools ranges from 1 to 17 at the least crowded school to 1 to 111 at the most crowded. Even within primary schools, teachers in higher grades have much smaller classes than those in lower grades, which are swollen with the huge influx of first-time students since last year.

In part, those chasms reflect the difficulty of getting teachers to work in remote rural areas and big urban slums. But the problem is also a legacy of political patronage and mismanagement, experts and officials said. Money alone will not fix things. It will require political will. Transferring large numbers of teachers to understaffed schools will mean taking on Kenya's powerful teachers' union, as well as communities and their political patrons who resist losing teachers to other areas.

The World Bank, the largest international donor supporting Kenya's education initiative, is pushing the country to rely more on teacher transfers than costly new hiring.

But the education minister, Mr. Saitoti, said in an interview that transferring female teachers would effectively force them to abandon their families. He estimated Kenya will gradually need to add 20,000 new teachers.

The country is also short of classrooms, latrines and water tanks.
Since 2003, Kenya has increased its own spending on education to 7.6 percent of gross domestic product, more than double the average in sub-Saharan Africa. And the World Bank has provided $40 million for textbooks and other materials.

In thousands of schools where books had been a rarity, millions of Kenyan children now share math, English and Kiswahili study guides. They also have pencils, notepads and other essentials. As the paperbacks wear out, Kenya will need about $20 million a year to replace them. And there is still little money for classroom construction. The ministry estimated more than 40,000 additional classrooms are needed. The cost will be more than $200 million. So far, there are scattered efforts. The African Medical and Research Foundation, a nonprofit organization based in Nairobi with an affiliate in New York, has adopted 10 Kenyan schools and will soon take on 40 more.

At the Mkaomoto primary school in Malindi, where children had to learn under mango and neem trees last year, the foundation has built six new classrooms, a library and nine latrines. Parents have contributed their labor to help keep costs down.

The World Bank expects to spend $100 million on education in Kenya over 5 years. The British are donating $75 million, the Swedes $7 million, the Canadians $6.7 million, the Americans $3 million and Unicef $2.5 million. Michael Kremer, a Harvard University economics professor who volunteered as a high school math teacher in Kenya after college and who has done years of research in Kenyan schools, said Kenya clearly needed both more foreign aid and domestic reform of its own education system.

Kenyan officials agree. But as the country scrambles to cope with rising demand for education, they also plead for help.

"There's a real need for our partners to look at ways and means of bridging the gap between where we are and where we are going," said Karega Mutahi, the education ministry's permanent secretary, "to help relieve suffering before there's time to turn around economic growth, to take the pressure off democracy."

Seizing an Opportunity

Word that education was free spread swiftly from child to child. And the children themselves have hungrily seized the opportunity. Joseph Lolo, 16, had worked six days a week since he was 13 grazing and watering the local headmaster's cows. The headmaster, Peter Mzungu, paid the boy $4 a month and gave him Sundays off. Joseph had watched enviously as the headmaster's children returned from school each day in their crisp uniforms. He longed to attend the public school the headmaster ran. But his family was too poor to pay the fees. Then last year, Joseph heard that fees had been abolished.Slowly, his resolve to go to school strengthened. This year, he went to his father, a crab trapper, who told him he should keep looking after Mr. Mzungu's cattle. The family needed the extra income. They live in two tiny,falling-down shacks. Only six of Joseph's 13 siblings have survived. Hunger and sickness have plagued the family.

But Joseph said he asked his father, "What will save me if I don't go to school?" Next, Joseph went to the headmaster, quit his job and asked for a spot at the headmaster's school, Kadzuhoni Primary. A tall strapping boy whose ears stick out from his closely shorn head, Joseph looks like a giant among the Lilliputians in the class of 83 first graders. The floor of the classroom is loose dirt and the children sit on ragged chunks of coral rock that tear holes in their shorts and skirts.

Joseph, who always sits against the wall, looks sheepish when the teacher insists they all stand to recite a child's refrain, "Head, shoulders, knees and toes." He towers over the other children, and his deep voice stands out among their high pitched ones. Still, he pats each body part along with them.

He feels lucky to be there. His teacher, Chengo Yeri, said he is a clever student, ranked fifth in the class. Joseph worked again for the headmaster during the August recess and used most of his earnings to buy a uniform so he can fit in better. On a recent morning, Mr. Yeri spelled out colors in English and asked the students, whose native language is Giriama, to say the word aloud. "B-l-a-c-k," Mr. Yeri said. Joseph's hand flew up, his fingers snapping. Mr. Yeri called on him, and Joseph whispered the correct word, a glint of triumph in his eyes. "Say black, all of you," the teacher replied, and they all chorused Joseph's answer in unison.

On the other side of the stone and concrete wall sat Dama Sulubu, 13, in Randu Nzai's class of 128 second graders. Dama is excruciatingly shy, but she has a will of iron. None of the four girls born to her father's three wives had ever gone to school. Dama's chances for an education shrank further when her mother, the youngest wife, fought with her father and left home four years ago. Dama became the responsibility of the elder wife, who felt a girl's place was working in the fields, not studying in school, Dama and other family members said. Several months before school fees were abolished, she left home, complaining there was not enough to eat, and found a $10 a month job in a nearby town as a live-in maid. At 11, she worked long hours mopping the floors, cleaning the toilets, cooking the meals and tending the children. But when the woman stopped paying her, Dama quit and took a bus home. Like Joseph, Dama had made up her mind. She wanted an education and she would not be denied. She went to her father, a farmer and cow herder. "Dama fought to get into school," said her illiterate

father, Chula Mbita, as he sat in their dusty courtyard, chickens pecking around his feet. "She came to me and said, 'Now that school is free, I have to go. All the children are going.' " Her father consented. The elder mother said she supports Dama's desire to go to school, but Dama said, in fact, her father's senior wife is still opposed to her education. Asked if she would stay in school, Dama replied, "I have two hearts." One told her to keep going just to prove her elder mother wrong. The other heart told her to give up. But Dama's teacher, Mr. Nzai, a natural showman who slides his oversize eyeglasses down his nose as he grades papers, has given her the little doses of encouragement lacking at home. He knows that it is the older girls in class who have defied family tradition to come to school - and it was the older girls he called on this day to tell a story aloud.

As Joseph was sounding out colors in English on one side of the wall, Dama rose to her feet on the other side to read from a picture book. Shyly, she held the book up high, so no one could see her face. The session drew to an end, and Mr. Nzai called the girls to the front of the class. With great ceremony, he presented each with a sweet cracker, a special treat for children who never have enough to eat. And he shook each one by the hand, thanking them for their effort.

"You have participated very well," he told them with a courtly formality. "Let us clap for them because they have really tried."

The rhythmic clapping rose into the rafters as the children applauded their classmates' small victories and a teacher's tender mercies.

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