2. Risk in the Theory of Investment
2.1 General Theory of Investment
2.1.1 Basic Theory of Investment
2.1.1.1 Definition and Categories of Investment

As economic actors make investments practically every day investing is a core economic activity. Firms build new production facilities, acquire better machines or try to enhance the capabilities of their staff by paying for seminars. In doing so they try to achieve future goals of the company by spending money or resources at present. Investment decisions deeply influence the profitability of firms in the future because they are a decisive determinant of the future competitive position. Therefore, staying in the market and making profits requires a careful planning of the investment program. Although the term investment is ubiquitously used in economic theory, its precise meaning often remains unclear. The etymological root of the word “Investment” lies in the Latin word “investire” which means to dress up. Modern economic theory offers various definitions of the term investment which cannot be completely discussed here.\(^1\) In microeconomics one can refer to an action as an investment when an economic actor spends money at present with the expectation to receive future returns which are supposed to be higher than the amount that has originally been spent. Investments usually imply the purchase of material or immaterial assets serving the interest of the investor. Economic theory claims that rational investors only invest in projects that help to attain the goals of the investor implying that investments will only be made, if they increase the profits of private firms.

Usually the price of an investment is known to the investor when planning a project. The benefits of investment projects, however, are normally uncertain. Investors may plan the expected cash flows from a given project but can never be sure that unforeseen events in the future will not alter this expected revenue stream. Essentially investments are a bet on returns that depend on uncertain future developments that cannot be completely foreseen ex ante. This is of particular importance, if the investment has a long pay off period. For example, an investment in a power plant requires huge payments for construction and operation. The benefits that are generated every year by the consumers’ payments are rather small compared to the initial cost implying that the break even point of the investor lies in the far future. It is straightforward to see that when investors plan future revenues for a long period, the risk that unforeseen events occur is higher. Corporate planning and strategic management of enterprises, however, involve many situations where the plans of the deciding actors extent to many periods. These characteristics imply that investment decisions are complex processes being the result of individual decisions based on current expectations about the future. Therefore, economic theory suggests that investment behavior is not only influenced by the volatility of the environment but also by the personal characteristics of the deciding actors. In sum, their information, their attitude towards risk and their personal

\(^1\) For an overview see Perridon/Steiner (1995), p.25.
expectations about the future all become decisive determinants of investment behavior.

Macroeconomics defines investments as payments that augment the physical capital stock of the economy. Aggregate investment and capital accumulation are decisive determinants of the economic performance of countries. In the neoclassical growth model the accumulation of physical capital can explain differences in per capita income. More recent contributions in growth theory consider investments in human capital and technological progress as decisive determinants of growth. Therefore, investment decisions of firms and private actors are highly relevant for national growth. Moreover, aggregate investment is a decisive component of the demand side in national economies implying that modeling in macroeconomics requires the study of the determinants of aggregate investment.

Economic theory identifies different categories or classes of investments. Although they cannot be completely discussed here, figure 2.1 depicts some basic classifications that are useful for a better understanding of the characteristics of investment projects. Financial investments may be made in stocks or bonds or other financial products. One can distinguish financial investments with fixed rates of return as for example government bonds from investments where investors mainly have speculative objectives.

Figure 2.1: Categories of Investments by Object

INVESTMENTS

FINANCIAL INVESTMENTS

REAL ASSET INVESTMENTS

INVESTMENTS IN TANGIBLE ASSETS

INVESTMENTS IN INTANGIBLE ASSETS

INVESTMENTS WITH FIXED RETURNS

INVESTMENTS WITH SPECULATIVE OBJECTIVES

Source: Own figure with reference to Götze/Bloech (1993).

The latter motive is relevant for investments in stocks or financial derivatives. Investments in non-financial assets in turn, can be either tangible or intangible. If a physical economic good is purchased one could speak of an investment in a tangible asset. If, in turn, a firm invests in the further qualification of the staff one may speak of an investment in intangible assets.

For an overview of growth theory see Barro/Sala-i-Martín (1995).

For an overview see Adam (1994).
2.1.1.2 Opportunity Costs, Time Preference and Net Present Value Approach

The previous paragraph showed that investments entail a payment for the acquisition of an asset, may it be tangible or intangible. Therefore, investing means a loss of liquidity, as financial capital of the investor is bound in acquired assets reducing the possible returns that economic actors could obtain by simply depositing their money in a bank. Hence, every individual has to consider these opportunity costs of investing by integrating foregone interest payments into his calculus since to be advantageous an investment has to offer higher returns than these opportunity costs. Moreover, as future profits do not have the same value as present payments, future cash flows have to be discounted with the current interest rate in order to make payments in different periods comparable and to allow for the calculation of a measure indicating the profitability of an investment. Assuming that firms can raise and deposit capital at the same level of interest, the interest rate becomes the best indicator for the opportunity costs of investment. In this framework the interest rate does not only cover the opportunity cost but also time preference. The so-called Net Present Value (NPV) is a measure capable of deciding whether investments should be undertaken or not. In economic models opportunity costs are usually modeled by using this approach. The NPV, however, assumes the existence of a perfect capital market meaning that financial capital is always available and that shortages in the supply of capital as credit rationing are absent. Moreover, a perfect capital market has a unique interest rate which is supposed to be valid for both investing and raising capital. These assumptions allow to analyze the profitability of investments apart from their financing as it is proposed in the Fisher-Separation-Theorem. Using these assumptions one can apply the following formula to calculate the profitability of a project:

\[
NPV = -I_0 + \sum_{t=1}^{T} CF_t (1+i)^{-t}
\]

where \(I_0\) is the initial payment for an investment and the second term on the right hand side the sum of the expected periodical cash flows \(CF\) discounted with the assumed interest rate \(i\). If the NPV exceeds 0, the investor should make the investment because its profitability is higher than the opportunity cost, that is, by investing in this project the actor is better off than by investing money at the current interest rate \(i\). If, in turn, the NPV is below 0, investing at the current interest rate \(i\) leaves the investor better off than realizing the project.

In addition to assuming a perfect capital market the NPV approach makes two more subtle assumptions. First, investments are supposed to be reversible, that is, acquired assets can be sold at any given point in time without additional cost. In other words, if the revenue stream changes in a way that the investment will become non-profitable, the investor has the possibility to disinvest without additional cost. The model assumes that investors can

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completely skip the project without facing "lock-ins" or sunk costs. It is obvious that many real world investment projects violate this assumption. Second, a possibility of waiting is absent in this approach. The NPV rule neglects the investor's possibility to postpone the decision which would be rational if the deciding actor can generate further useful information about the project. The NPV model, in turn, assumes that a firm has the possibility to invest right now or never again. Examining real world investment decisions one finds that postponement is at least a feasible option. If the strategy of waiting reduces uncertainty over future prices, costs or market developments, it is rational for the decision maker to wait. In this case a rational investor would weight the costs of waiting against the benefits of new information. Costs of waiting are twofold: foregone future cash flows and advantages potential competitors might gain during the period of delay. If the benefits of waiting exceed the cost, rational investors would postpone the investment and preserve an option to invest in the future.\(^5\) The discussion shows that although widely used the NPV rule only has limited explanatory power for the analysis of investment projects.

### 2.1.2 Models of Investment under Certainty

#### 2.1.2.1 Overview

This paragraph reviews some theoretical models of investment under certainty that have been influential in the literature.\(^6\) The accelerator approach based on pioneering work by Clark models aggregate demand as the decisive determinant of the capital stock. Variations of demand imply variations of the capital stock via investment implying that the main determinant of investment is the variation of demand.\(^7\) Keynes focuses on the role of private expectations to explain investment. He points out that the decision to invest depends on the expected future profits of investment projects. Keynes uses the marginal efficiency of capital as a measure on which firms base their investment decisions.\(^8\) If the NPV approach is applied, marginal efficiency is obtained by setting equation (2.1) equal to 0 and solving for \(i:\)

\[
(2.2) \quad NPV = -I_0 + \sum_{t=1}^{\infty} CF_t (1 + i)^{-t} = 0
\]

The marginal efficiency of capital is the rate of return of an investment. If the investment yields a higher return than the market rate, it is profitable and will be realized. The opposite holds if the current market rate exceeds the marginal efficiency. The marginal efficiency of capital is sensitive to changes of expectations. If economic actors expect a general economic downturn in the future, they will also expect lower cash flows. Therefore, a change in the investors' perception of the future can depress the level of investment without

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\(^5\) I will extend this critique of the NPV approach in paragraph 2.1.2.3 Paragraph 2.1.3 introduces two models that capture the effects of irreversibilities and the option of waiting.

\(^6\) Although many of these models have the drawbacks that have been exposed in the preceding paragraph, they are briefly exposed here because they are widely used in the literature.

\(^7\) See Clark (1917).

\(^8\) See Keynes (1989).
a change of fundamental economic variations. Uncertainty, however, is only mentioned verbally in the work of KEYNES but not explicitly modeled.9

One of the most frequently used specifications for the analysis of investment behavior is the neoclassical model based on pioneering work by JORGENSON.10 In this model the firm maximizes the discounted flow of profits over time by choosing the corresponding optimal capital stock. Investment is induced by the difference between the current capital stock and the profit maximizing capital stock $K^*$. The basic idea of the model can be illustrated by using a simple example. Assume that firms can rent capital at a price of $r_K$ and the profit of a firm $p$ depends besides other factors characterized by $A_1,...,A_N$ on the amount of capital that is employed. The net profit of the firm at a given point in time becomes:

$$NP = \pi(K, A_1, ..., A_n) - r_K K$$

The profit maximizing choice of capital is given by the first order condition where $\partial p / \partial K$ is the first partial derivative of NP with respect to $K$:

$$\frac{\partial p}{\partial K} (K, A_1, ..., A_n) = r_K$$

Equation (2.4) states that the firm will rent capital up to the point where its marginal revenue equals its rental price $r_K$ which implicitly defines the capital stock maximizing net profit. Investment is then determined by the difference between the current capital stock and the desired stock of capital.

JORGENSON makes use of this basic thought in his neoclassical model.11 The demand for the capital stock is determined to maximize net worth which is defined as current revenue less expenditure including taxes. Maximizing net worth subject to a standard neoclassical production function with the constraint that the rate of growth of $K$ is net investment (gross investment less replacement) JORGENSON obtains the following first order conditions:

$$\frac{\partial Q}{\partial L} = \frac{w}{p}$$

$$\frac{\partial Q}{\partial K} = \frac{c}{p}$$

Equation (2.5) states that in the optimum the marginal productivity of labor $\partial Q / \partial L$ has to equal the real wage $w/p$. Equation (2.6) shows that the marginal

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9 The reason why the model of Keynes is placed under the heading models under certainty may seem puzzling. But as argued above his treatment of uncertainty remains verbal and is not formally modeled. Therefore, the author decided to leave the theory in this paragraph.

10 See Jorgenson (1963) and (1971).

productivity of capital $\frac{\partial Q}{\partial K}$ has to equal its cost. The difference between (2.4) and (2.6) lies in the interpretation of the cost term. As firms usually do not rent capital, the numerator of the second ratio of equation (2.6) can be interpreted as the price of capital which JORGENSON called the user cost of capital $c$ which depends on a set of variables that vary with the national tax system.

JORGENSON assumes that output, employment and capital stock are determined by an iterative process. Each period, production and employment are set to the levels corresponding to the first marginality condition with capital stock fixed. Under the described assumptions the process converges to the desired maximum of net worth where the optimal capital stock $K^*$ depends on the planned output and a set of price variables which appear in the user cost of capital. As the firms do not face adjustment costs or delivery lags, they can achieve any $K^*$ instantaneously implying that the current capital stock immediately adjusts via investment to the desired capital stock that maximizes net worth. Investment is thus determined by variations of the optimal capital stock $\Delta K^*$.

There are many critical remarks concerning the neoclassical investment model which cannot be listed here completely.\(^2\) For our purpose it is enough to underline two shortcomings of the reviewed models. Since both models use the NPV approach, they are subject to the same criticism that has already been exposed above, that is, they assume that investments are reversible and that there is no option to wait. Unlike the Keynesian model, the neoclassical model does not incorporate uncertainty or expectations of actors. Instead, firms choose their optimal capital stock by equating the user cost of capital with the marginal revenue of capital. Investment decisions are taken without regard to what costs or marginal revenue of capital are to be assumed for the future.

2.1.2.2 The q-theory of Tobin

2.1.2.2.1 The Basic Model

The basis for the q theory of investment pioneered by TOBIN is the theory of portfolio selection that analyzes how investors structure investment portfolios considering risks and returns of assets they currently hold or intend to hold.\(^3\) Rational investors choose a utility maximizing portfolio by considering return, risk, transaction cost for acquisition and liquidity of assets. Portfolio diversification allows for the reduction of the aggregate risk, if acquired assets are not completely and positively correlated. TOBIN'S q is defined as the market value of a marginal unit of capital divided by its replacement cost and can be written as:

\[
q_r = \frac{P^M}{P^R}
\]

\(^{12}\) An overview is given by Chirinko (1993) p.1879.

\(^{13}\) See Tobin (1969).
where \( P_m \) is the current market value and \( P_r \) the replacement cost. \textsc{tobin} argues that a firm increases its capital stock by investing, if the value of this ratio is greater than unity because in this case additional capital is value increasing for the firm. Values of \( q \) smaller than unity imply that the firm has an incentive to reduce the capital stock either by disinvestment or decreasing replacement spending. It has to be underlined that the results are only valid for marginal variations of the capital stock and not average \( q \). In economic models \( q \) is used to model private incentives to increase or decrease the capital stock via investment. A value of \( q \) exceeding unity triggers additional investment because the current market value of capital is higher than its replacement cost. In turn, values of \( q \) less than unity mean that the market value of additional capital is lower than the replacement costs which implies a reduction of the capital stock. The equilibrium value of \( q \) is unity because firms neither have an incentive to invest nor to reduce the capital stock.

2.1.2.2.2 The Romer Model

2.1.2.2.2.1 The Model

In the \textsc{romer} Model \( q \) is interpreted in a different way.\textsuperscript{14} Assume the presence of \( N \) identical firms, a purchase price of capital goods that is constant and equal to unity. Further assume a firm that maximizes its profits facing costs of adjusting its capital stock taking account of the fact that it is costly for a firm to increase or decrease its physical capital stock. The marginal adjustment costs are assumed to be increasing in the size of the adjustment, that is, the bigger the desired change, the higher the cost of changing the capital stock. Finally, assume for simplicity that the rate of depreciation is 0. In the discrete time model the firm's maximization problem can be formally described with the following Lagrangian:

\[
L = \sum_{t=0}^{\infty} \frac{1}{(1 + r)^t} \left[ \pi(K_t) - I_t - C(I_t) + q_t(K_t + I_t - K_{t-1}) \right]
\]

where \( \pi(K_t) \) are the firm's profits, \( I_t \) its investment and \( C(I_t) \) the adjustment costs that depend on \( I_t \), and the last term describes the condition that the capital stock in the next period equals the sum of the current capital stock plus investments in the current period. Calculating the first order condition and rearranging terms one obtains equation (2.9):

\[
1 + C'(I_t) = q_t
\]

The equation implies that a firm will invest up to the point where the cost of acquiring capital equal the value of the capital. The cost of capital consists of the purchase price that was assumed to be fixed at unity and the marginal adjustment costs \( C' \). \( q \) can be interpreted as the shadow price of capital.

\textsuperscript{14} If not cited otherwise the following explanations are based on \textsc{romer} (2001). Only the necessary formal components of the model will be presented. For a detailed formal formulation of the model see \textsc{romer} (2001) p. 370.
because it shows how an additional unit of money invested in the capital stock changes the present value of the firms' profit. In other words, q measures the impact on profits if the capital constraint is loosened marginally. If q is high, the firm has a high incentive to invest, if q is low the opposite holds. q can also be interpreted according to the definition of TOBIN as the ratio of the capital's market value to its replacement costs. If q exceeds unity, (2.9) implies additional investment and vice versa.

To show how q evolves over time one can use a current-value Hamiltonian function to solve the maximization problem of the firm. In analogy to the discrete time case one obtains the following first order condition characterizing the optimum:

\[ 1 + C'(I_t) = q(t) \]

Like in the discrete time case the firm invests up to the point where the cost of acquiring new capital equals the value of capital. One can derive a second condition which characterizes the optimum in the continuous time case:

\[ \pi(K(t)) = rq(t) - q_c(t) \]

This condition states that the marginal revenue product of capital equals its user cost where \( q_c \) is the derivative of q with respect to time. Rewriting this as an equation for q yields:

\[ q_c(t) = rq(t) - \pi(K(t)) \]

This implies that q is constant when \( rq = \pi(K_t) \), or \( q = \pi(K_t)/\rho \). From (2.12) equation (2.13) can be derived stating that the value of a unit of capital at a given time equals the discounted value of its future marginal revenue products.

\[ q(t) = \int_{T=t}^{\infty} e^{-\rho(T-t)} \pi(K(T))dT \]

Having derived the characteristic conditions in the optimum one can now analyze the dynamics of the model in a phase diagram. If the rate of change of the capital stock is denoted with \( \kappa \), one can show that the variation of \( K \) depends on the value of q. Equation (2.10) states that each firm invests up to the point where the purchase price of capital plus the marginal adjustment costs equal the value of capital q. Since \( C'(I) \) is increasing in I, it follows that I is increasing in q. The fact that \( C'(0) \) is zero implies that I is zero when q equals unity. Therefore it can be derived that \( \kappa = 0 \) when \( q = 1 \) and that \( \kappa \) is increasing when \( q > 1 \). On the other hand when \( q < 1 \) I becomes negative. Economically this means that if q equals unity, the firms do not have an incentive to invest as the market value of the marginal unit of capital equals its replacement costs. Consequently the capital stock remains unchanged and it

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15 For the formal solution see Romer (2001).
follows $\kappa=0$. However, if $q$ has a value which exceeds unity, it becomes advantageous to invest since the market value of the marginal unit of capital exceeds its replacement costs. Thus, $\kappa>0$ and the capital stock will grow which is shown by the bold arrow in the upper part of Figure 2.2. Finally, if the value of $q$ is smaller than unity, the firm has an incentive to disinvest and the growth rate of the capital stock will be negative as it is shown by the bold arrow in the lower part of figure 2.2. Thus, for all points above the $q=1$ line $\kappa$ is positive implying a growing capital stock while for every point below the $q=1$ line $\kappa$ is negative which implies that the capital stock is decreasing.

**Figure 2.2: Dynamics of the capital stock**

![Figure 2.2: Dynamics of the capital stock](source: Romer (2001))

The dynamics of $q_c$ can be derived from equation (2.12) and its implications.

**Figure 2.3: Dynamics of q**

![Figure 2.3: Dynamics of q](source: Romer (2001))
Since \( \pi (K) \) is assumed to be decreasing in \( K \), the set of points that satisfy equation (2.12) is downward-sloping in the \((K,q)\) space which is shown in figure 2.3. The fact that \( q_c \) is increasing in \( K \) implies that \( q_c \) is positive to the right of the \( q_c=0 \) line and negative to the left.

The phase diagram in figure 2.4 combines the information of the two previous figures in one graph by showing how \( K \) and \( q \) must behave to satisfy the conditions that describe the derived optimum.

**Figure 2.4: The Phase Diagram**

![Phase Diagram](image)


In point E the system reaches its stable long term equilibrium. When the initial value of the capital stock is given while the market value of capital is free to adjust, all initial levels of the capital stock that lie above the \( \kappa=0 \) and right to the \( q_c=0 \) as well as all that below the \( \kappa=0 \) line and left of the \( q_c=0 \) will not converge to a stable equilibrium. However, it can be shown that these paths violate the transversality condition that must hold in the optimum implying that all these paths can be ruled out.\(^{16}\) For all other initial levels of \( K \) the dynamics of \( q \) and \( \kappa \) bring the system to the saddle path and finally to the long-run-equilibrium in point E.

The saddle path is shown as a bold line in figure 2.5. The economic intuition behind this path is straightforward. Assume the systems starts at a given point on the saddle path to the left of E. As the corresponding value of \( q \) is greater than unity, additional investment is induced and the capital stock is growing. Decreasing returns to scale imply that the market value of capital is decreasing with further accumulation of capital. Hence, additional capital accumulation is falling over time. As prices are assumed to be constant, the value of \( q \) is constantly falling until again unity is reached bringing the system to the long run equilibrium E where \( q \) is equal to unity which implies that \( \kappa=0 \) and \( q=0 \).

\(^{16}\) See Romer (2001).
Economically this means that the firms have no further incentive to decrease or increase their capital stock. For all initial levels of \( K \) that lie to the right of the relevant saddle path the line of argumentation is analogous.

**Figure 2.5: The Saddle Path**

![Saddle Path Diagram](source: Romer (2001).)

The phase diagram allows for the analysis of the impact of exogenous shocks on investment behavior and the evolution of the capital stock.

**2.1.2.2.2 Analyzing the Model**

This paragraph analyzes the impact of exogenous shocks on investment behavior and the long run equilibrium by using the example of a change in national tax policy. Assume that the tax takes the form of a direct payment which applies to the purchase price of the capital.\(^{17}\)

Figure 2.6 illustrates the effects of a tax reduction on the variation of the capital stock. Assume that the economy starts in the long run equilibrium \( E_1 \). One can see from equations (2.11) and (2.12) that a higher tax would reduce the firm's profits for a given level of \( K \) while a lower tax would have the inverse effect. Changing the tax code would therefore shift the \( q_e = 0 \) locus up or down since profits are now higher or lower for any given capital stock. If firms are optimizing, \( q_c \) will jump up immediately to the point A on the new saddle path where \( q \) exceeds its equilibrium value of unity which implies additional investment. The dynamics of \( K \) and \( q \) will then gradually move down to the new long run equilibrium in \( E_2 \).

\(^{17}\) In reality the effects of taxing on investment are much more difficult to measure because they alter the financing structure of firms as credit or bond financing has a tax shield effect. For reasons of simplicity these effects will be neglected.
The economic logic behind this process is straightforward. In the initial equilibrium $E_1$ the new tax code increases the market value of capital. As replacement costs were assumed to be fixed at unity, $q$ jumps up to a value greater than unity implying new investment. Facing decreasing returns to capital the additional profits of capital accumulation are falling with additional investment. Thus, over time the accumulation of capital reduces the value of $q$ until the system reaches the new equilibrium in $E_2$ where $q=1$. In other words, a permanent tax cut produces a temporary boom in investment that leads to a higher capital stock corresponding to $E_2$.

### 2.1.2.3 Critical Evaluation of the Models

The review of commonly applied investment models already showed some of their common characteristics. With the exception of verbal arguments by Keynes all reviewed models do not include uncertainty about future developments. As real world investors constantly deal with problems of uncertainty, the explanatory value of investment models remains limited unless uncertainty is explicitly modeled. The previous analysis also highlights that most of the orthodox models are explicitly or implicitly based on the NPV-approach. As already pointed out, this relies on two basic assumptions: the reversibility of investments and the absence of a waiting option. In real world investment projects these assumptions are often violated. First, real world investors are usually confronted with asset specificity meaning that acquired capital goods cannot or only at high costs be utilized for other purposes. Williamson identifies several forms of asset specificity, namely physical aspects, brand name specificity and human capital specificity. The basic idea of asset

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specificity can be illustrated by the concept of fundamental transformation. If a contract between two economic actors results in an investment that is specific for the contracting parties free choice of contracting is lessened by the resulting mutual dependence of the contracting parties because of the irreversible characteristics of the investment.  

While in transaction cost theory asset specificity explains vertical integration, here it is enough to conclude that asset specificity leads to sunk costs. Sunk costs are defined as the share of investment projects that cannot be recovered if the project is skipped. A good example is an investment in a power plant. Machines that are used for power generation can hardly be used for other purposes. The workforce is solely trained to work in power generation implying high additional costs of schooling when people have to be employed elsewhere. The costs for marketing campaigns cannot be recovered at all when the project is skipped. The fraction of an investment that can be considered as sunk varies considerably with the characteristics of the analyzed object. In general, industrial investments should theoretically imply a high degree of sunk cost because the acquired capital goods are specifically designed to produce a certain product or a group of products. Consequently their use for other purposes is limited and canceling a project implies a loss of the money invested in those specific capital goods. In particular investments in infrastructure are characterized by high irreversibility as the provision of services normally requires huge networks or large specific production facilities. Although one may plausibly argue that the degree of irreversibility is lower in the service sector, even certain investments in this sector require high specific investments for human capital formation or specific information technology. To sum up, the degree of reversibility depends on the individual characteristics of the project and the sector that is invested in.

When examining the reversibility of non-specific capital goods such as computers, one has to take into account the "lemons problem". As the quality of used durable goods cannot be exactly estimated by potential customers, they are not willing to pay high prices. A demand favoring low prices however leads to an offer of reduced quality. These imperfections of the market are finally leading to adverse selection. For investors this means that even theoretically reversible investments yield lower returns when they are sold on the market for other purposes. Eventually, also existing regulations and institutional settings can reduce the reversibility of invested capital. An example are national laws protecting workers and restricting layoffs. All these real world characteristics of investment projects lead to the conclusion that the neo-classical assumption of full reversibility of capital is too restrictive.

A second fundamental assumption of the NPV-approach is the absence of a waiting option. Since the NPV assumes that firms have the possibility to invest right now or never, the model neglects the possibility to postpone a decision, which would be rational if the deciding actor can generate further useful

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19 See Williamson (1985).
information about the project. Summing up, the reviewed orthodox models are not suitable for the analysis of investment problems because they neglect waiting options and asset irreversibility.

2.1.3 Investment under Uncertainty

2.1.3.1 Overview

All models that have been analyzed up to the point were based on the assumption of complete information. Investors are perfectly informed about their future revenue streams and do not face uncertainty about these payments. If not perfectly informed about the future, investors face the risk of unforeseen events that may decrease the planned profit of investment projects. Unforeseen events may even be influential enough to make investments unprofitable that have ex-ante been considered as advantageous. Therefore, it may be assumed that introducing uncertainty into models of investment should have a considerable impact on the investment decisions of firms. Furthermore, the orthodox models assumed implicitly that investments are completely reversible meaning that investors can sell their capital goods at any given point in time without additional cost. It has been argued above that this assumption is strong and usually not in line with the characteristics of real world investments. Problems of asset specificity and adverse selection imply that investment projects contain a considerable fraction of sunk costs. As firms are faced with the irreversibility problem ex ante, they will be aware of it when making a decision. Moreover, it was argued that orthodox models of investment do not include a waiting option although a strategy of waiting may be profitable if waiting generates new valuable information. The models which are presented in the following paragraphs release the assumption of complete certainty, full reversibility and no waiting option.

2.1.3.2 Characteristics of Uncertainty and Risk

Using the terms uncertainty and risk requires a precise definition of their meaning. Orthodox models assume that investors know a project's revenue stream ex ante implying that the decision of the investor is made under certainty. Formally this means that the future outcome of the investment has only one value or revenue stream $x_1$ that is realized with the probability of $p(x)=1$:

$$x_1, p(x) = 1$$

(2.14)

Uncertainty occurs when the revenue stream of the investor is not secure, that is, ex ante the investor does not know future outcomes. Usually all real world investment decisions are made under complete uncertainty which is characterized by two facts. First, the investor does not know the number of possible scenarios that may occur in the future. Second, the probabilities for the occurrence of possible future scenarios are unknown to the decision maker. These two properties of complete uncertainty render the decision problem even more complex. To keep the decision problem simple and analytically tractable it will henceforth be assumed that uncertainty only means choosing between different possible data situations in the future. That is, the
number of possible data situations and their corresponding payoffs are assumed to be known by the deciding agent. Formally this means, that there is now more than one outcome or revenue stream that may be generated in the future, say $x_1, x_2, \ldots, x_n$. Thus, one can write the possible outcomes as

$$x_1, x_2, \ldots, x_n, \text{with } 0 < p(x_i) < 1$$

If the probabilities of the $x_i$ are known to the investor, the literature speaks of risk. If, on the contrary, they are unknown the situation is classified as uncertainty.\textsuperscript{21} Despite of this fixed terminology the author prefers to define the situation with known probabilities as uncertainty while the case of unknown probabilities may be denominated complete uncertainty. This distinct definition is useful because classifying a situation as risky requires another important property that will be described later. To sum up, uncertainty and risk occur in situations where future returns vary about an expected amount. The greater this variability of expected future returns, the greater the uncertainty or the risk for the investor.

Faced with uncertainty a carefully planning firm can structure the decision problem with the use of two criteria. First, the frequency with which a decision problem occurs, and second, the availability of probabilities for the possible future outcomes $x_i$. The combination of these two criteria leads to three possible classes of uncertainty that are depicted in figure 2.7.

**Figure 2.7: Classes of Uncertainty**

<table>
<thead>
<tr>
<th>FREQUENCY OF DECISION</th>
<th>AVAILABILITY OF PROBABILITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unique</td>
<td>Yes</td>
</tr>
<tr>
<td>Informational Shortcomings</td>
<td>Complete Uncertainty</td>
</tr>
<tr>
<td>Often</td>
<td>Yes</td>
</tr>
<tr>
<td>Uncertainty</td>
<td>Informational Shortcomings</td>
</tr>
</tbody>
</table>

Source: Own figure based on Adam (1996).

In the literature on decision making under uncertainty only the case of complete uncertainty and uncertainty are covered. However, it is obvious that in both cases of informational shortcomings the investor has the possibility to increase his level of information by generating probabilities for future data scenarios. If a decision problem occurs frequently, investors can use statistical methods to generate a probability distribution. Hence, over time they dispose of probabilities for the different future scenarios and the decision problem may be classified as uncertainty. For the case that the decision problem is unique, but probabilities are known the actor faces an informational asymmetry, as he does not dispose about information that is available on the market. That may be the case if the wanted probabilities are known by insurance companies that

will base their decision on them but not by firms that sign insurance contracts. However, if markets were perfect the actor could base the decision on the information. That is to say, if markets are assumed to be efficient the decision maker faces the problem of uncertainty. Therefore, one can argue that if markets are perfect and decision makers use all available information, uncertainty and complete uncertainty remain the only relevant cases for analysis. The existing decision rules for the case of complete uncertainty however, only offer poor results because the problem becomes formally un-treatable. Therefore, the analysis will henceforward be restricted to the case where the number of future scenarios and their corresponding probabilities are known to the investor.

Although the literature speaks of risk in this case, it is important to stress that introducing uncertainty to an investment problem does not necessarily imply the emergence of a risk for the decision maker. Thinking of a firm which has to choose between two strategies leading to different future payoffs in different data situations, uncertainty does not imply a risk for the company, given the possibility that it can adjust its strategy afterwards without facing additional cost. Only if the company has to make an ex ante decision which is not or only at high cost reversible, it has to deal with risk as the current decision affects future profits of the company. Therefore, risk can be defined as uncertainty over future developments affecting the investor's future returns because a chosen strategy is irreversible. Uncertainty, on the contrary, only refers to situations where the evolution of future payoffs is not known to decision makers but where an adjustment of strategy is possible without additional cost.

2.1.3.3 Uncertainty in the Romer Model

2.1.3.3.1 Modification of the Model
If uncertainty about the future profitability of investment is assumed, the model of paragraph 2.1.2.2.2.1 has to be modified. As uncertainty can have various reasons that will not be further discussed here, the example of uncertainty about changing tax policy will be analyzed. If uncertainty is introduced into the model, equation (2.13) which states that the value of a unit of capital at a given time equals the discounted value of its future marginal profits has to be modified. With uncertainty about future profitability the firm will now base its decision on the expected value of profits. Thus, equation (2.13) will modify to:

\[
q(t) = \int_{T=t}^{\infty} e^{-r(T-t)} E_i \{ \pi(K(T)) \} dT
\]

According to (2.16) as before firms invest up to the point where the cost of acquiring new capital equal the expected market value of capital. From this one can derive:

\[(2.17) \quad E_t \left[ q_c(t) \right] = rq(t) - \pi(K(t))\]

This expression is analogous to equation (2.12) with the expectations term for \(q_c\) being the only difference to the model with certainty meaning that the market value of capital depends on expected payoffs instead of certain cash flows.

2.1.3.3.2 Effects of Uncertainty on Reversible Investments

If investments are assumed to be reversible, investors can disinvest at any given point in time without additional cost. It was pointed out verbally in paragraph 2.1.3.2 that uncertainty only causes risks for investors when irreversibility of assets exists. If, in turn, investments are completely reversible uncertainty does not imply a risk because strategies can still be adapted to changing circumstances. Integrating this flexibility into the model means that adjustment costs are symmetric for increasing and decreasing a firm's capital stock.

To show the effects of uncertainty the example of the tax cut will be modified for the case of uncertainty. Consider that the government is planning a reduction of taxes at a given time in the future and that the proposal for the tax cut will be voted on after a time interval \(T\). Let us further assume that the probability that the proposal will pass is 0.5 and that there is no other source of uncertainty. Figure 2.8 illustrates the evolution of the capital stock in the phase diagram.

Figure 2.8: Tax Reduction with Uncertainty and Reversible Investment

![Phase Diagram](Source: Own figure)
In the case of certainty an acceptance of the proposal would shift the \( q_c=0 \) line to the position of the \( q=0 \) line with the new intercept of the \( \kappa=0 \) and the \( q_c=0 \) line marking the new long run equilibrium \( E_2 \). If the proposal was rejected the \( q_c=0 \) line would remain unchanged with the old intercept marking the old long run equilibrium. Hence, after the proposal is voted on in \( T \) the system will converge to either \( E_1 \) or \( E_2 \).

If the proposal is already discussed but not voted on, the resulting uncertainty changes the outcomes. Since the probability of a successful vote is 0.5, the expected \( q_c=0 \) line must be midway between \( q_c=0_1 \) and \( q_c=0_2 \). The saddle path corresponding to the case of uncertainty is shown as a dotted line in figure 2.8. Before the vote the dynamics of \( q \) of \( K \) would converge to the point \( E_{UC} \) marking the intercept of this line with the \( \kappa=0 \) line. If the vote takes place, \( q \) will jump up or down corresponding to the outcome of the vote implying that as long as uncertainty persists the system is on a different saddle path than without uncertainty. Compared to the saddle path of the long run equilibrium \( E_2 \) under certainty investment is lower when uncertainty exists.

Assume that the proposal will be passed after a certain time of uncertainty. As argued above for the time of uncertainty the dotted saddle path becomes relevant. Remember that \( \kappa \) is increasing in \( q \) which means that the jump of \( q \) induces additional investment. Let us assume that the proposal is accepted implying that the long term equilibrium is \( E_2 \). The lower jump of \( q \) compared to the case of certainty acts to reduce the value of capital before the vote, and thus reduces investment. Compared to points on the saddle path corresponding to \( E_2 \) as final outcome one can identify an investment gap which is shown by the bold arrow in figure 2.9.

**Figure 2.9: Effects of Uncertainty with Reversible Investment**

![Figure 2.9: Effects of Uncertainty with Reversible Investment](source: Own figure)
Specifying the interval of uncertainty \([K_{E_1}, K_T]\) it is obvious that the jump of \(q\) and the corresponding level of investment is lower than in the certain case for every possible level of \(K\). If the proposal is rejected, the investment gap turns to an investment surplus depicted by the dotted arrow in figure 2.9. For a given interval of uncertainty \(q\) implies higher investment for every possible level of \(K\) than in the case of certainty. Thus, one can conclude that uncertainty over future economic policy measures with an expansive impact reduces investment. On the other hand, uncertainty can also imply additional investment when there is uncertainty over restrictive policy measures. Therefore, the model does not permit to derive a clear cut result concerning the effect of uncertainty on investment spending. This result is consistent with the analysis in paragraph 2.1.3.2 which concluded that in the case of fully reversible assets uncertainty does not imply a risk for investors and should not have an effect on investment behavior.

2.1.3.3 Effects of Uncertainty on Irreversible Investments

In this paragraph it is assumed that investment projects are irreversible. Irreversibility can be modeled by assuming that the adjustment costs for variations of the capital stock are asymmetric meaning that reducing the capital stock is more costly than augmenting it. In the phase diagram a saddle path with irreversibility becomes concave because if \(K\) exceeds its long run equilibrium value, it will fall only slowly because disinvestment is costly. On the other hand, if \(K\) is less than the long-run equilibrium, \(K\) grows very fast as upward adjustments are less costly. This new slope of the saddle-path is depicted in figure 2.10.

**Figure 2.10: Effects of Tax Reduction with Uncertainty and Irreversible Investment**
Consider again the example of a planned tax cut. As before, uncertainty causes the saddle path to be midway between the two saddle paths that represent the two long-term equilibria under certainty. With uncertainty about the proposal \( q \) still jumps up but less than in the case of reversible investments indicated by the bold arrow in figure 2.10. As higher values of \( q \) imply higher investment spending the introduction of irreversibility causes the amount of induced investment to be smaller.

The economic logic behind this result is straightforward. Knowing that they cannot reduce their capital stock without additional cost in the future firms hesitate to invest more unless they have a clear picture of the future. This decreases the market value of capital before the vote and reduces investment. Obviously there is a value of waiting that reduces the additional amount of investment.\(^{24}\)

Figure 2.11 compares the different effects of introducing uncertainty when investment is assumed to be either reversible or irreversible. The model starts from the initial long run equilibrium corresponding to point \( E_0 \). The saddle paths under certainty are represented by \( SP_1 \) and \( SP_2 \). Assuming that the proposal is finally passed permits an analysis of the effects of uncertainty on investment. The two saddle paths in between characterize the situation of uncertainty if again a 50% chance of the proposal for being passed is assumed. The concave saddle path represents the situation where investment is irreversible while the straight line represents the saddle path for reversible investments. In the case of certainty the tax cut would shift the saddle path to \( SP_2 \) corresponding to the long run equilibrium in \( E_2 \) and \( q \) jumps up to point A. Then the dynamics of \( q \) and \( K \) will bring the economy to its new long run equilibrium.\(^{25}\)

In a situation of uncertainty the two saddle paths which are located midway between \( SP_1 \) and \( SP_2 \) become relevant. When investment is reversible, the saddle path is a straight line and thus \( q \) jumps up to the point B. For the interval of uncertainty the system will converge along the saddle path to the uncertain equilibrium \( E_{uc} \). During the time of uncertainty investment is therefore lower than in the certain case. The arrow AB in figure 2.11 shows the lower level of \( q \) that implies foregone investment for one given level of \( K \). This amount is again depicted in the lower part of figure 2.11 showing the relation between \( q \) and investment spending where \( I \) is assumed to be a linear function of \( q \). In the following analysis this amount will be referred to as the "Uncertainty Gap".

\(^{24}\) Paragraph 2.1.3.4 offers a detailed analysis of the Dixit/Pindyck model which assumes that there is an option value of waiting which reduces the amount of investment.

\(^{25}\) Note that in the case of certainty the saddle path cannot be curved. As future events are clear to foresee for investors they can always choose the corresponding optimal capital stock without the risk to overinvest. Thus, the benchmark curve for the saddle path of irreversible investment is a straight line.
When investment is irreversible the relevant saddle path is concave implying that at the time the proposal is considered q jumps up to point C. Due to the slope of the saddle path the resulting jump of q is smaller than in the case of certainty. During the interval of uncertainty the system will converge along the new saddle path to the uncertain equilibrium $E_{UC}$. Knowing that the uncertain
equilibrium \( E_{\text{UC}} \) can only be reached for an infinite interval of uncertainty it may be concluded that investment in this case is lower than in the case of reversibility for every possible level of \( K \). Thus, for any given level of \( K \) there is an amount of investment that is foregone due to the existence of irreversibility. This gap that will henceforth be called "Irreversibility Gap", is depicted with the arrow BC in the upper and the lower part of figure 2.11.

In contrast to the results of the previous paragraph the investment surplus in case of a rejection of the proposal (line \( E_1C \)) is smaller than the investment gap (line AC). Hence, the existence of the irreversibility gap permits the conclusion that uncertainty reduces investment spending when investments are irreversible. Knowing that a higher degree of irreversibility causes the saddle path to become more concave and the "Irreversibility Gap" larger one can further conclude that the amount of forgone investment is growing in the degree of irreversibility.

The economic reasoning leading to this result is intuitive. As firms know that building up higher capacities in times of uncertainty could imply an undesirable "lock-in" when the ex-post environment turns out to be less favorable, their investment will all other things equal be lower than under certainty. In this case there seems to be a value of waiting for the firm that keeps it from investing at present.

2.1.3.4 The Dixit/Pindyck Model

2.1.3.4.1 Overview

The macroeconomic model in the previous paragraph was not capable to explain the value of waiting that implied the reduced investment spending in the presence of irreversible investments. Recent developments in investment theory offer new tools for the analysis of investment problems that may serve as microeconomic foundation for this value of waiting. PINDYCK and DIXIT/PINDYCK offer a new perspective for the analysis of investment problems by using the analogy to option pricing and introducing irreversible investments and waiting options.\(^\text{26}\) The basic idea is that opportunities to invest are comparable to common stock options. Investment opportunities are characterized by a firm's ability to make an investment in the future based on its individual technical knowledge, experience, market position, patents, the ownership of land or other possible resources. Economic theory postulates that the value of a company depends on its discounted future cash flows that in turn depend on its capacity to generate investment opportunities for the future. With an investment opportunity the firm holds an option that is comparable to a financial call option on a common stock. It offers the right but not the obligation to buy an asset at some future time for a fixed price, the value of which is unknown ex ante. Likewise, a real option allows the firm to invest in a project the future value of which is unknown today. Making the investment is analogue to exercising the option because it means losing the

\(^{26}\) In the literature this approach is referred to as a real option approach. See Dixit/Pindyck (1994) and Pindyck (1991). See also the review by Hubbard (1994).
flexibility to invest in the future if projects are irreversible since in a world with sunk cost resources are bound. Making the investment also implies not having the possibility to wait for new useful information about the future. As loosing these future options implies opportunity costs for the firm every decision rule that ignores the destroyed option value has to be in error.

As already argued above all orthodox models of investment do not consider this option value. This implies that the decision rule changes to \(\text{NPV} > F(V)\) where the expression on the right side represents the value of the option which measures the opportunity costs of investing at present that are caused by the elimination of the option for a future investment. Introducing this basic idea into an investment model DIXIT/PINDYCK find that higher uncertainty over future developments increases the value of the option to invest but decreases investment spending. Confronted with increasing uncertainty over future developments it becomes advantageous to keep the option to invest because the value of future information is increasing.

2.1.3.4.2 The Model
This paragraph presents a basic version of the DIXIT/PINDYCK model illustrating the general idea and allowing for a better understanding of the argument. Assume that a firm which is considering an irreversible investment faces uncertainty about its future product prices. In the next period the price of the product will either rise with the probability of \(p\) to a known level \(P_1\) or fall with the probability of \((1-p)\) to a known level \(P_2\) and then stay forever at this level. If the price falls, the investment generates a negative NPV which means that a rational investor would not engage in the project. For simplicity further assume that the firm produces one product per year without operating cost. To decide if it is better for the investor to wait one year or to invest now one can compare the NPV at both times. Assuming that the facility can be used forever and produces one product per year the NPV now is given by:

\[
\text{NPV}_0 = -I + \sum_{t=0}^{\infty} E(P)/(1 + r)^t
\]

where \(I\) is the price of the facility and \(E(P)\) the expected value of the cash-flow equal to the expected price of the product. Postponing the investment one period the NPV becomes:

\[
\text{NPV}_t = p(-I/(1+r) + \sum_{t=1}^{\infty} P_i/(1+r)^t)
\]

This may explain why many empirical studies of investment behavior do not offer satisfying results. Firm level studies have shown that the internal hurdle rates of firms are usually higher than orthodox models would predict. This may be explained by the option value that is implicitly considered by the enterprises. See Dixit/Pindyck (1994) p.7.

If not indicated otherwise the following is based on Dixit/Pindyck (1994) and Pindyck (1991).
Note that in period 0 there is no expenditure and no revenue. In period 1 the firm will only invest if the price goes up to $P_1$, which happens with a probability of $p$. As the price of the product is known in one year, the firm may discount its certain future cash-flow $P_1$ to the period 0. By comparing both values the investor can decide if it is advantageous to invest now or to wait a year and make the investment decision subject to the new information about the product price. If the value of NPV$_1$ exceeds the value of NPV$_0$ waiting will be a better strategy for the firm. To better illustrate the implications of this approach I use a simple numerical example. Consider that a firm is planning to invest irreversibly in a ship building facility that can be constructed instantly at a price $I$. For simplicity assume that the facility can produce one ship per year at operating costs of zero. Currently the price of ships is 200 €. With a probability $p$ the price of ships will go up to 300 € and with the probability of $(1-p)$ the price will fall to 100 € and then remain forever at the newly fixed level as it is shown in figure 2.12.

**Figure 2.12: Evolution of the Ship Price**

<table>
<thead>
<tr>
<th>$t=0$</th>
<th>$t=1$</th>
<th>$t=2$</th>
<th>......</th>
<th>$t=\infty$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_0=200$</td>
<td>$P_1=300$</td>
<td>$P_2=300$</td>
<td>......</td>
<td>$P_\infty=300$</td>
</tr>
<tr>
<td>$P_0=100$</td>
<td>$P_1=100$</td>
<td>$P_2=100$</td>
<td>......</td>
<td>$P_\infty=100$</td>
</tr>
</tbody>
</table>

Source: Dixit/Pindyck (1994) p.27

Assume that $I=1600$, the discount rate is 0.10 and that $p=0.5$. Now the NPVs of the project can be calculated to decide if it is better to invest now or to wait one year for the new information about the evolution of ship prices. Investing now would generate the following present value:

\[
NPV_0 = -1600 + \sum_{t=0}^{\infty} \frac{200}{(1,1)^t} = -1600 + 2200 = 600
\]

The current value of the ship building facility 2200 € exceeds its initial cost of 1600 € entailing that the NPV is positive. According to the orthodox NPV rule the investment is profitable and investors should go ahead with the investment. Let us now assume that the investor waits one year and invests only if the price for ships goes up to 300 €. The NPV of investing in one year is:

\[
NPV_1 = 0.5(-1600(1,1)^{-1} + \sum_{t=1}^{\infty} \frac{300}{(1,1)^t}) = 773
\]

---

29 See Dixit/Pindyck (1994).
Since the NPV is higher if the firm waits a year, waiting is the better decision. If the investment is made today, the investor pays 1600 € for a project that is worth 2200 €. In turn, if he waits a year, he will pay 1600 € for a project that is then worth 3300 €. With a falling price he would pay the same amount but receive an asset that is just worth 1100 € implying that in this case he will not make the investment and keep the option to invest. The flexibility to make the investment decision next year is exactly worth the difference of the two NPV: 173 €. In other words, the investor should be willing to pay 173 € for an investment opportunity that is flexible. An investment decision just based on equation (2.20) neglects the opportunity costs of investing now, disabling an investment in one year. It is important to stress that this result only holds, if the investment is irreversible and if there is a possibility to wait. If another firm is considering the same investment and a first mover advantage only allows the first mover to operate the business profitably, there is no waiting option and no opportunity cost of investing now. In this case the traditional NPV-rule is valid and the investment should made today. The same result is obtained when the project is reversible, that is when the initial payment of 1600 can be fully recovered if the price of ships should fall. Therefore, the opportunity costs of investing today (losing the opportunity to invest in one year) only needs to be considered if the investment is irreversible and a waiting option exists.

An analogy to financial call options on common stocks is useful for a better understanding of this result. A stock option gives the right to make an investment expenditure (the exercise price of the stock) the value of which varies stochastically. An investment problem has essentially the same characteristics. The investor has the option to invest in a project at a price I, the value of which varies with the evolution of the price of ships in the next period. The option will only be exercised when the price of ships goes up to 300 €. If the price falls, a rational investor will not exercise the option because the NPV becomes negative. This analogy to stock option permits to calculate the value of the investment opportunity with methods of option pricing.30

Let $F_0$ be the value of the investment opportunity today and $F_1$ the value next year. $F_1$ is a random variable that depends on the ship price next year. The two possible values of $F_1$ are known. If the price goes up, the value of $F_1$ is 1700 ($\sum 300/(1.1)^t -1600$), if the price goes down the investor will not exercise the option because the NPV becomes negative making the value of the option 0. The problem is to find the value of the investment opportunity today $F_0$. To do so one can create a portfolio containing the investment opportunity and a number of ships that makes the portfolio risk free, that is, independent of the evolution of the ship price. A given risk free rate that is assumed to be 10% permits to calculate the option value by simply setting the portfolio's return equal to that rate.31 Let us assume a portfolio in which the investor holds the

30 For an introduction to option pricing see Perridon/Steiner (1995).
31 This equation must hold because otherwise there would be the possibility of arbitrage for investors. The construction of the portfolio requires the existence of a "spanning possibility" that is there has to be a future market for ships. See Pindyck (1991) p.1116.
investment opportunity and sells short the number \( n \) of ships for hedging it. The value of this portfolio today is:

\[
\Phi_0 = F_0 - nP_0 = F_0 - 200n
\]

The value of the portfolio in one year is given by:

\[
\Phi_1 = F_1 - nP_1
\]

depending on the future value of \( P_1 \). With \( P_1 = 300 \) one obtains \( \Phi_1 = 1700 - 300n \), with \( P_1 = 100 \) \( \Phi_1 = -100n \). To be independent of the evolution of \( P \), \( n \) must have a value that solves \( 1700 - 300n = -100n \). Solving this equation one obtains \( n = 8.5 \). The return from holding the portfolio over the year is given by equation (2.24) where the term \( 0.1P_0 \) has to be included because the expected value of \( P_1 \) is 200. With an expected price change of 0 however, no rational investor would be willing to hold the long position unless he receives a payment which at least equals the risk free rate that was assumed to be 10%.

\[
\Phi_1 - \Phi_0 - 0.1nP_0 = 680 - F_0
\]

As the portfolio is risk free, its return equals 10% of the initial value of the portfolio because otherwise rational investors had the possibility of arbitrage. Hence, one can write:

\[
680 - F_0 = 0.1(F_0 - 1700)
\]

From equation (2.25) one can easily see that \( F_0 \) is 773 €, which is exactly the same value that is obtained by calculating the NPV under the assumption of waiting a year. The value of the investment opportunity, that is, the option to invest in a given project in the future is 773 €. Recall that the payoff from investing today in equation (2.20) was 600 €. Loosing the option to invest in the future implied an opportunity cost of 773 € that exceeds the expected payoff from the investment (600 €) The full cost of the investment are therefore \( I + F(V) \), in our example they amount to 1600+773. One can easily see that 1600+773>2200, which means that the full cost of the project exceeds its benefits and the firm should keep alive the option to invest. If the firm based its decision on the simple NPV rule it would make a sub-optimal choice.

Figure 2.13 illustrates this graphically. The thin line in figure 2.13 shows the value of \( V-I \) while the bold line represents the value of the option \( F(V) \) depending on the value of the project \( V \). For all values of \( V<1/1.5 \) the value of the option is 0 because the firm will never invest because even if the ship-price goes up by 50% the value of \( V \) will be less than the initial cost of the project. If the firm never invests the option value has to be zero because in any case
there will be no investment in the future. For values of $V > I/1.5$ the value of the option becomes positive. The $V-I$ line shows the net benefits of the project. In absence of the opportunity cost of the option value every present value of future payments that exceeds the cost of investment $I$ would make the project profitable. One can see that the critical value for the profitability of the project $V^C$ is identified by the intersection of the $V-I$-locus and the abscissa. If the firm considers the full cost of the investment, profitability requires a discounted value of future payments that exceeds the sum of initial cost and opportunity cost.

**Figure 2.13: Cost and Benefits of the Project with Option Value**

$V^*$ marks the new critical value where $V = I + F(V)$ implying that for values of $V$ which exceed this critical value the project's return is higher than its full cost. In our example this would imply that $V > 1600 + 773$.

It can be concluded that the presence of the option value can make the analyzed project unfavorable in the current period. Hence, with uncertainty fewer investment projects will be profitable compared to the case of certainty. Therefore, in the presence of uncertainty investment spending in the current period is, all other things equal, lower. The value of the option drives a wedge between the traditional NPV rule and the new profitability criterion the size of which is determined by the value of the option to invest in the future. The DIXIT/PINDYCK model permits to derive the result that in the presence of irreversible investments uncertainty implies a value of waiting that reduces investment spending in the current period. However, as uncertainty is only
modeled for two periods, it is interesting to extend the analysis to more periods.\(^{32}\)

In a complexer model DIXIT/PINDYCK show the effects of uncertainty when the value of the project varies continuously over time. In this model the level of uncertainty is measured with the parameter \(\sigma\) that is defined as the variance of the project's value over time. As figure 2.14 indicates the graphical solution is analogous to the previously analyzed model and its characteristics are essentially the same. The value of the option follows a curved line when it depends on a \(V\) that varies continually over time. \(V^*\) characterizes the critical value at which it is optimal for the firm to invest when there is a positive option value. For the case of certainty \(V-I\) shows the net return of the project. In this case \(F(V)=0\) and the investment is favorable if \(V-I>0\). \(V-I\) is represented by the straight line in figure 2.14. \(V^C\) is the critical value for \(V\) in the case of the certainty.

**Figure 2.14: Characteristics of the Solution in the Continuous Time Case**

Including the opportunity cost of investing today the critical value of \(V\) is given by \(V^*\), which is the tangency point of the \(F(V)\) line and the \(V-I\)-locus. In this point \(F(V)=V-I\), that is, the opportunity costs of investing today equal the net value of the project. In other words, the value of the project \(V\) equals its full costs \(I+F(V)\) consisting of its direct cost \(I\) plus the opportunity costs of investing \(F(V)\). For the investment to be profitable \(V\) has to exceed \(V^*\) at least at an infinitesimal small amount. For every \(V\) below \(V^*\) one can see that \(V<I+F(V)\) implying that investing is not favorable because the project's value is lower

\(^{32}\) The analysis can be extended to 3 or more periods with the same approach. See Dixit/Pindyck (1994) p.41.
than the full cost of the project. As in the two period model the positive option value \( F(V) > 0 \) in the case of uncertainty implies that fewer investment projects may be considered as profitable. In the case of uncertainty the critical value of \( V \) exceeds the critical value in the case of certainty by \( V^* - V^C \). Therefore, the occurrence of uncertainty depresses investment because the opportunity costs of investing render fewer projects profitable. While uncertainty about future evolutions of the product market increases the value of \( V \), it decreases current investment spending.

2.1.3.4.3 Analyzing the Model

This paragraph analyzes the effects of a variation in the model's parameters which permits to model the effects of increasing uncertainty. In the Dixit/Pindyck model growing uncertainty can be modeled by increasing \( \sigma \).

Recall the example of the ship building facility in the two periods framework. Assume that due to higher volatility on the market for ships the variation of the ship price in period 1 increases. With the same probability of 0.5 the price will now either rise to 350 € or fall to 50 €. This new situation is depicted in figure 2.15.

**Figure 2.15: Evolution of Ship Prices**

\[
\begin{align*}
\text{t=0} & \quad \text{t=1} & \quad \text{t=2} & \quad \ldots & \quad \text{t=∞} \\
\text{P_0=200} & \quad \text{P_1=350} & \quad \text{P_2=350} & \quad \text{P_∞=350} \\
\text{P_1=50} & \quad \text{P_2=50} & \quad \text{P_∞=50}
\end{align*}
\]

Source: Dixit/Pindyck (1994) p.27

With increasing up and down changes the variance of \( P_1 \) rises which reflects the higher uncertainty on the ship market while the price change is mean preserving, that is, the expected value of \( P_1 \) is still 200 €. Calculating the value of the investment as above with the new value of \( P_1 \) entails that \( F_0=1023 \) €. Hence, higher uncertainty increases the value of the option to invest. As a higher value of the option means higher opportunity cost of investing today, fewer projects will become profitable. Thus, all other things equal, higher uncertainty reduces investment (because the investors will rather wait) but increases the value of the investment opportunity. The reason for the increase of the option value is straightforward. The mean preserving spread of the ship price in period 1 increases the upside potential pay-off from the option because if the price goes up to 350 the value of the investment opportunity grows. At the same time the downside pay-off remains unchanged because if the price goes down to 50 the value of the project is less than in the case where the price changed to 100. Since the investor will not invest in this case (he will not exercise the option), the value of the option remains zero.
However, when potential profits increase while potential losses remain unchanged, the value of the option necessarily has to increase. Higher uncertainty, in turn, means a greater incentive to wait because the option value increases. Figure 2.16 depicts the graphical solution of the continuous model which is analogue to the two periods model.

**Figure 2.16: Effects of Higher Uncertainty**

As the variance of the expected returns grows, the possible positive variation of the value of the firm’s investment increases. Like in the two-periods model potential loss is limited to 0 because the option to invest will only be exercised if the value of V goes up. Therefore, the tangency point of the F(V) line and V-I has to be at a higher value of F(V) and the F(V)-line shifts to the left. As figure 2.16 highlights the new tangency point V*₂ indeed corresponds to a higher level of F(V). A higher value of F(V) in turn implies higher opportunity costs which renders fewer projects profitable.

An increase in uncertainty therefore means a reduction of investment, as it becomes more profitable to keep the option to invest instead of making the investment. This reduction of investment is accompanied by a rising value of the investment opportunity. Measuring the value of the firm as the sum of all investment opportunities this result implies that the value of the firm is rising with higher uncertainty although it invests and produces less.³³ Summing up, the model shows that an increase of σ further reduces investment spending of firms permitting two final conclusions. First, the occurrence of uncertainty

³³ Pindyck (1991) uses this implication of the model to explain the behavior of oil companies in the 80s. While prices were falling, uncertainty over future prices rose. In response, oil companies paid more and more for oil-bearing lands while their development expenditures and their production were falling.
decreases investment spending. Second, investment spending is falling, when uncertainty increases as current investment flows are falling in σ.

2.1.3.5 Critical Evaluation of the Models
The previous paragraphs reviewed two models analyzing the effects of uncertainty on investment behavior. The ROMER model with reversible investment offered ambiguous results. In contrast, when investments were assumed to be irreversible, the model shows that uncertainty reduces investment spending and this reduction is growing in the degree of irreversibility. The DIXIT/PINDYCK model confirms these findings and provides an intuitive micro-economic foundation for the results of the ROMER-Model. Moreover, the model permits to show that rising uncertainty depresses investment spending, that is, higher uncertainty means less investment.

ABEL/EBERLY argue that these findings are only valid for firms starting with a capital stock of zero because irreversibility also has a so called hangover-effect which prevents the firms from reducing their capital stock in economic downturns. As disinvestments, which would be economically desirable, are not possible due to the irreversibility firms keep the existing capital stock. Therefore, the net effect of uncertainty on the capital stock is in the long-run unclear. Although this criticism is valid for the evolution of investment stocks, the effects on periodical investment flows are not affected by a hangover effect. If firms are aware of the fact that over-investment may be hard to reduce in future periods, periodical investment spending will be lower implying that the hang-over effect is irrelevant for investment flows in a given period. Therefore, despite of the hang-over effect, the conclusion that uncertainty combined with asset irreversibility reduces investment flows remains valid.

A more severe drawback of the DIXIT/PINDYCK model is that it neglects first mover advantages since firms are assumed to have a waiting option. The observation of real world markets shows that this is not the case in many industries. In particular investments in high technology sectors as microprocessors are characterized by enormous first mover advantages. Therefore, the neglect of first mover advantages limits the explanatory power of the model. Nevertheless, it is possible to identify many real world situations where the delay of an investment project is a feasible option.

2.1.4 Summary of Propositions
This paragraph summarizes the main propositions of the investment models that have been reviewed on the previous pages. It was found that uncertainty theoretically has a depressing effect on investment spending, if investments are irreversible. Furthermore, increases in uncertainty further depress investment spending, that is, periodical investments are decreasing in the level of uncertainty. Therefore, all exogenous influences that imply further uncertainty for firms will all other things equal result in less investment spending. Moreover, it can be concluded that reductions of investment spending are...
growing in the degree of irreversibility confirming the intuitive economic logic that investment projects with a high share of sunk costs are more sensitive to rising uncertainty. Apart from these direct results the investment models also have important implications for the dynamics of investments behavior. As uncertainty only implies risk for investing firms if investment is not reversible an economy with long lasting high levels of risk will not only observe a reduction of investment but most likely also a change in the structure of investment. The reason for this dynamic effect is straightforward. Perceiving long lasting levels of high uncertainty economic actors prefer investments with low levels of irreversibility and short pay-off periods. However, many investments that are crucial for economic development are characterized by the opposite characteristics. For example infrastructure projects usually imply a high degree of irreversibility and long pay-off periods. Therefore, high uncertainty over long periods of time can result in systematic under-investment in sectors with low reversibility.

Whether one likes this or not, the multinational corporation is probably a tendency that cannot be stopped. Through its propensity to nestle everywhere, settle everywhere, and establish connections everywhere, the multinational corporation destroys the possibility of national seclusion and self-sufficiency and creates a universal interdependence.  

2.2 Theory of International Investment

2.2.1 Overview

The economic literature on the theory of international investment is far too large to cover it completely in this volume. Nevertheless, the author considers it useful to offer a brief overview of the most important theoretical contributions in this field to allow for a better understanding of the following arguments. Although international capital flows may be divided into foreign direct investments (FDI), portfolio investments, loans and grants, this analysis entirely focuses on FDI. The following paragraph starts with a brief definition of FDI and sums up its main characteristics. It is argued that studying the theory of FDI eventually means studying the determinants that drive the decisions of international corporations because international capital flows are closely related to the behavior of multinational enterprises (MNEs). Thus, understanding the underlying logic of FDI flows requires basic knowledge about the theory of MNEs. Thereafter, follows a closer analysis of the determinants of FDI and the influence of uncertainty and risk on incoming flows. Although the current theory does not provide clear recommendations about the determinants of aggregate FDI, potential determinants and their theoretical plausibility are discussed.

36 For an overview see Dunning (1993).
37 See Williamson (2001).
38 This is important for the empirical analysis on the macro-level which requires the inclusion of control variables for the empirical estimation of FDI flows. See Chapter 4.
2.2.2 Definition and Characteristics of FDI

Despite the pressure of international organizations for uniformity there are still various definitions of FDI in the literature.\(^{39}\) The USA provided a first definition in the year 1937 by defining inward FDI as "all foreign equity interests in those American corporations or enterprises which are controlled by a person or group of persons ... domiciled in a foreign country. Equity interest encompasses all holdings of common and preferred stock, advances, and inter-company accounts." Despite of its importance there is no precise definition of the term control. In the outward survey of 1950 the U.S. Department of Commerce gives a more precise definition of the characteristics of control. In this document direct investments are "United States equity in controlled foreign business enterprises... as statistically defined for the purpose of this survey". The definition includes four main categories:

1. Foreign corporations, the voting securities of which are owned to the extent of 25% by persons or groups, ordinarily resident in the United States
2. Foreign corporation, the voting stock of which was publicly held within the United States to an aggregate extent of 50% but distributed among stockholders, so that no one investor or group owned as much of 25%
3. Sole proprietorships, partnerships or real property held abroad by residents of the United States
4. Foreign branches of United States corporations

The definition of FDI endorsed by the OECD and the IMF avoids the idea of control. Instead, "Foreign direct investment reflects the objective of obtaining a lasting interest by a resident entity in one country (direct investor) in an entity resident in an economy other than that of the investor (direct investment enterprise)".\(^{40}\) The term lasting interest refers to the existence of a long-term relationships between the direct investor and the enterprise and a significant degree of influence on the management of the enterprise. With this broad definition the OECD delivered a specification. A foreign direct investment enterprise is defined as an incorporated or unincorporated enterprise in which a foreign investor owns 10% or more of the ordinary shares or voting power of an incorporated enterprise or the equivalent of an unincorporated enterprise. Moreover, OECD points out that it does not require absolute control by the foreign investor. Instead, an effective voice, as evidenced by an ownership of at least 10%, implies that the investor is able to influence, or participate in the management of an enterprise.\(^{41}\) FDI compromises not only the initial transaction but also all subsequent transactions between the investor and the direct investment enterprise. Therefore, also reinvested earnings are contained in FDI flows.\(^{42}\)

This definition of OECD, that is also used by the IMF, is governing for all balance of payments compilations. The United Nations System of National Accounts however, provides a different definition of FDI which retains the idea of control. Subsidiaries that are to more than 50% owned by a foreign

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\(^{39}\) If not otherwise indicated the overview of FDI definitions is based on Lipsey (1999).

\(^{40}\) OECD (1996b) p.7-8.

\(^{41}\) See OECD (1996b) p.7-8.

company are labeled with the term foreign-controlled resident corporations. If the share of foreign ownership is between 10 and 50%, the companies are classified as associates and may be excluded or included by individual countries according to their qualitative assessment of foreign control. This definition refers more to the micro level focusing on the decisions of international investors and their impact on host country development. Unless stated otherwise data in this volume is based on the definition given by OECD and IMF. However, the discussion showed that the line between FDI and portfolio investment is not clear and that classifying real world investment flows is difficult. In spite of empirical problems of measurement the theoretical distinction helps to analyze the implications of different flow types for host economies.

A closer analysis of the characteristics of foreign investment flows suggest that the effects of FDI and portfolio investment on host countries are distinct. FDI differs from other investment flows in at least two main aspects. First, as the definition in the previous paragraph indicates FDI implies a lasting interest of the investing entity in the acquired object. Although the definition avoids the term of control, it means that the investing entity exerts a significant influence on the management of the company resident in another country. Enterprises engaged in FDI usually have a motivation that exceeds the mere seeking of short-term profits. Instead, FDI implies the existence of a long term strategic interest of the investor in the acquisition. Second, rather than being just a capital flow, FDI involves the transfer of a package of assets or intermediate products which includes money capital, management expertise, technological know-how and human capital. FDI does not only complement local savings of the home country but in addition supplies more effective management and technology, in particular for developing countries. Nevertheless, the impact of FDI on developing host countries is a topic that has been widely discussed for a long time. Critics of FDI flows to developing countries state that in the case of imperfect markets with large barriers to entry MNEs can drive domestic producers out of the market and extract rents that eventually lower domestic savings and investment. Even at present the theoretical literature on FDI does not offer a clear picture of the effects of FDI for recipient countries. A positive impact on host countries depends on the market structure and the number of linkages of the investment project with the host economy. However, if enough forward and backward linkages exist and the investments induce technological spillovers, host countries will experience a growth stimulating effect. Various empirical studies indicate that FDI exerted a positive impact on

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43 See Lipsey (2001b) p.3
44 For a discussion of the term "influence" see Dunning (1993) p.5.
46 The dependency theory, which predicts negative effects of FDI, was particularly influential in Latin America.
48 The corresponding literature is far too large to cite here. A good overview of the existing contributions can be found in Munro (1995) p.33-62 and Lall (2002).
the welfare of host countries.\textsuperscript{49} Although there is much empirical evidence that foreign investment “crowds in” domestic investment, the overall picture remains mixed.\textsuperscript{50} Despite of the criticism concerning FDI flows, most developing countries are eagerly seeking to enhance incoming FDI. To ensure growth enhancing positive externalities the targeting of certain industries which are assumed to fulfill the exposed prerequisites has become an important topic.\textsuperscript{51}

Besides its importance for the economic development of recipient countries the notion of lasting interest has yet another important implication. Since one characteristic of FDI is irreversibility, withdrawing quickly during a crisis becomes a less feasible option and investors stay in business. Several financial crises in the 90s showed that the volatility of financial flows is a potential threat for countries opening up for investment from abroad. Empirical studies show that FDI is indeed a less volatile source of capital than other investment flows.\textsuperscript{52} Analyzing investment behavior in recent financial crises one observes that outflows of FDI are considerably lower than other outflows.\textsuperscript{53} Therefore, FDI seems to be a more sustainable source of capital for host countries as the risk of a sudden reversal of flows is limited due to the long-term interest of investors. Despite of the criticism on FDI it remains an important potential stimulator of growth for recipient countries. This is in particular the case for developing nations, provided that the country’s markets are competitive and the number of linkages with the host country economy are sufficient. If these requirements are met, FDI should theoretically have a welfare-increasing impact on host countries.

2.2.3 Theoretical Determinants of FDI

2.2.3.1 Overview

Rather than a single identifiable act the investment decision process is a complex succession of acts that involves many elements.\textsuperscript{54} The theory of international investment has essentially been seeking to analyze two main aspects of this complex process. First, the factors that motivate firms to engage in international production and second, the factors that influence the choice of its location. These two basic questions have been studied by many scholars from various different perspectives. This paragraph briefly describes both theoretical approaches, the ones explaining the motivations of firms to engage in international investment and the theoretical contributions that seek to explain the choice of location for investment to developing countries.\textsuperscript{55}

\textsuperscript{50} See UNCTAD (1999b) p.171-173.
\textsuperscript{51} See UNCTAD (1999b) p.183.
\textsuperscript{52} See Lipsey (2001a).
\textsuperscript{53} See Williamson (2001). During the Mexican financial crises in 1994 for example the outflow of FDI was limited. See Graham/Wada (2000).
\textsuperscript{54} See Aharoni (1966).
\textsuperscript{55} Empirical studies on the determinants of FDI location are reviewed in paragraph 2.2.4.2.
As most of the decisions to invest directly abroad are made by managers in multinational parent companies, the MNE is the dominant vehicle for FDI and the current theory explaining FDI is essentially a theory of MNEs. A MNE can be defined as a parent company that engages in foreign production or other activities through its own affiliates, that exercises direct control over the policies of those affiliates, and that strives to design and implement business strategies and other functions that transcend national boundaries. The first explanations for the behavior of MNEs were not completely embedded in a comprehensive theoretical framework. They are either descriptive or view international investment as a process that originates in the will of national companies to internationally diversify production. Following the latter approach the main determinant of international capital movements is the difference between the return on invested capital in different countries. More recent theories to explain international firm activity may be divided into four main schools which are, together with important corresponding authors, depicted in table 2.1.

Hymer presented a criticism of the classical view that internationalization is just a means of portfolio diversification by pointing out that firms which want to operate successfully in foreign markets need to have a comparative advantage, if they want to be able to face their local competitors. This competitive advantage is an important prerequisite for FDI given the fact that local producers possess better access to information about the local market than foreign companies giving them a considerable advantage vis-a-vis their international competitors. To make successful international investments possible the multinationals that engage in foreign markets need certain advantages in technology, marketing, management or organization processes that cannot easily be adapted by the local firms.

Kindleberger elaborates on the nature of the monopolistic advantages of MNEs and shows that they may arise in the goods market (e.g. marketing skills), the factors market (e.g. access to capital) or stem from the ability to achieve vertical or horizontal integration. Caves names the monopolistic advantage a “unique asset” and postulates that horizontally integrating firms acquire them via product differentiation. Moreover, he argues that vertically integrating firms do not rely on unique assets but are just interested in ensuring their long-time supply and pricing of input goods.

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59 See Hymer (1990) and Hymer (1976).
60 See Hymer (1990).
Table 2.1: Theories to Explain International Investment

<table>
<thead>
<tr>
<th>Theory</th>
<th>Authors</th>
<th>Main Arguments</th>
</tr>
</thead>
</table>
| 1. Monopolistic Advantage Theory | Hymer (1990), Hymer (1976)        | • Local firms have better information about the local market  
                                   |                                 | • MNEs that enter a domestic market must have a monopolistic advantage vis-a-vis their local competitors  
                                   |                                 | • Transactional market failure implies organization of production via hierarchies  
                                   | Kindleberger (1989)             | • MNEs that enter a domestic market must have a monopolistic advantage vis-a-vis their local competitors  
                                   |                                 | • Source of monopolistic advantages can be the goods market, the factor market or the ability to engage in vertical or horizontal integration  
                                   | Vernon (1966b)                  | • FDI can be explained by changing monopolistic advantages of MNEs during the product cycle  
                                   |                                 | • Production is transferred abroad when a higher product maturity makes labor cost more important  
                                   | Caves (1974)                    | • FDI may be classified in vertical, horizontal and conglomerate  
                                   |                                 | • The base for horizontal investments are unique assets of the firm  
                                   |                                 | • Vertical investment are made to secure availability and pricing of input  
                                   | 2. Oligopolistic Reaction Theory | Knickerbocker (1973)             | • Risk avoiding members of an oligopolistic market will follow one another in any substantial foreign market  
                                   |                                 | • This parallel investment is most likely to occur in highly concentrated industries with heterogenous products  
                                   |                                 | • This investment behavior is also found in vertically integrated markets where firms check their competitors efforts to secure input supply  
                                   | 3. The Internalization Theory    | Buckley/Casson (1976), Casson (1979), Rugman (1981), Buckley (1987) | • A firm will internalize the production of intermediate goods when markets fail  
                                   |                                 | • Firm will internalize markets as long as costs outweigh the benefits  
                                   |                                 | • Firm specific knowledge is an important reason for internalization  
                                   | 4. The Eclectic Paradigm         | Dunning (1981), Dunning (1993)   | • FDI takes place when three conditions are simultaneously fulfilled: a firm possesses ownership specific advantages, market failure implies internalization advantages and the host country offers location-specific advantages  
                                   |                                 | • Location-specific advantages are not limited to natural resource endowments but also include the cultural, legal, political and institutional environment of host countries  

Source: Own Table

VERNON relates the patterns of international trade and investment to the degree of maturity of the analyzed product.\(^63\) He argues that FDI can be explained by the changing monopolistic advantages of firms during the product cycle. In the early stages of its development the product is still not standardized and because of the monopolistic situation the price elasticity of demand is comparatively low. Marketing of the product requires direct contact

\(^63\) See Vernon (1966b).
to the customers and a high degree of flexibility. When international wage differentials outweigh the cost and uncertainty of producing in other countries production facilities are transferred abroad. Like this production facilities move to other developed countries and with further growing standardization to developing countries. With a highly standardized product at the end of the life cycle the innovator countries will import the products from abroad.

The oligopolistic reaction theory based on the work of Knickerbocker postulates that international production occurs due to a strategic reaction of the firm to the behavior of its competitors. That is, firms in an oligopolistically structured market follow their competitors in any substantial foreign market. In doing so firms protect the exploitability of their firm specific assets and limit the scope for their competitors to strengthen their own firm specific advantages.64

Another group of theorists sought to provide an alternative and deeper micro-economic explanation for the existence of FDI. Starting from the theory of the MNE these authors are not only asking the question why firms engage in international transactions but also why firms choose foreign ownership instead of licensing. In this category of literature one can cite the internalization theory and the eclectic paradigm of international production. The internalization theory rises the question why international transactions are rather organized in hierarchies than in markets.65 It tries to explain the fact that firms build production facilities in foreign countries instead of serving the market by exporting their products or by using the instrument of licensing. The core prediction of the approach is that with a given distribution of factor-endowments, the form of MNE activity is influenced by the cost of hierarchical organization relative to the cost of the market. The firms decide how to best serve the market by comparing the cost of using the market via exports with the cost of integrating production horizontally or vertically. The main explanation of FDI in this approach stems from market failures that render exporting or licensing (using the market) more costly than engaging in FDI (using hierarchies). Hence, the internationalization of firm activity is not entirely due to location specific variables but is explained by the benefits of internalization.66

The internalization approach is capable of explaining why firms choose FDI rather than serving foreign markets by licensing or exports. However, the empirical observation that some countries attract large inflows of FDI while others are largely ignored by MNEs suggests that also country specific characteristics are important for foreign investment decisions. When country specific factors play an important role in the decision process of MNEs, different country patterns have to be considered as a third dimension that influences the firm's investment decision. In addition to monopolistic and internationalization advantages the eclectic paradigm allows for the integration of

64 See Knickerbocker (1973).
country specific factors as determinants of FDI. In this paragraph no attempt will be made to provide for an exhaustive analysis of the literature on international location theory. Instead, the coverage of theories will be limited to those that offer an explanation for the location of FDI in developing countries. Table 2.2 provides an overview of important theoretical contributions to explain FDI in the developing world.

Table 2.2: Theories to Explain the Location of FDI Flows to Developing Countries

<table>
<thead>
<tr>
<th>Theory</th>
<th>Authors</th>
<th>Main Arguments</th>
</tr>
</thead>
</table>
| 1. The International Product Cycle Theory   | Vernon (1966b)                | * FDI can be explained by changing monopolistic advantages of firms during the product cycle  
* Production is transferred abroad when a higher product maturity makes labor cost more important  
* Over time the location of production shifts from developed countries to developing countries |
| 2. The International Division of Labor      | Fröbel/Heinrichs/Kreye (1981) | * Cheap labor and highly standardized production processes permit a transfer of production to developing countries  
* This transfer is not limited to labor intensive industries but also takes place in industries that rely heavily on energy or raw material as well as those that are the source of environmental pollution |
| 3. Neoclassical Theory of Investment        | Kojima (1973)                 | * FDI is determined by factor endowments of countries |
| 4. The Eclectic Paradigm                    | Dunning (1981), Dunning (1993)| * FDI takes place when three conditions are simultaneously fulfilled: a firm possesses ownership specific advantages, market failure implies internalization advantages and the potential host country offers location-specific advantages  
* Location-specific advantages are not limited to natural resource endowments but also include the cultural, legal, political and institutional environment of the host country |

Source: Own table

VERNON'S approach has already been reviewed above. Another group of theorists state that factor costs play a decisive role in the process they call “the international division of labor”. Stimulated by the availability of cheap labor in developing countries, lower transport costs and production processes that may be realized with minimum skills firms from developed countries are relocating their production into the developing world. Production takes place in those countries that provide for the most profitable factor combination.\(^67\)

Focusing on a macro perspective one can ask why countries engage in FDI and what determines the attractiveness of countries for FDI in certain industries. KOJIMA extends the neo-classical theory of factor-endowments to international investment problems. He argues that outbound FDI is undertaken by firms that produce intermediate goods that require resources in which the home country has a comparative advantage, but that generate value added activities that require resources and capabilities in which that country is comparatively disadvantaged. To explain FDI between developed countries

Kojima distinguishes different underlying motives as trade barriers and transaction- as well as transportation costs. Without neglecting the explanations of MNE activity the eclectic paradigm of DUNNING allows to integrate country specific factors as determinants of FDI. In recognizing the importance of firm specific, market specific as well as location specific factors the eclectic paradigm serves as a synthesis between these two approaches in the literature. Therefore, it may serve as an analytical framework for empirical research on FDI.

2.2.3.2 The Eclectic Paradigm as Analytical Framework
Although there are many potential motives for firms to engage in FDI that vary to a large extent with the industrial sector and the characteristics of the given firm, it is possible to provide a general overview of theoretical motives for FDI. DUNNING distinguishes four main reasons for a firm's decision to engage in international activity which are depicted in figure 2.17.

![Figure 2.17: Basic Motivations for FDI](image)

### Figure 2.17: Basic Motivations for FDI

<table>
<thead>
<tr>
<th>Natural Resource Seeking</th>
<th>Market Seeking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical resources</td>
<td>Following suppliers or customers</td>
</tr>
<tr>
<td>Labor</td>
<td>Adaptation to local tastes</td>
</tr>
<tr>
<td>Technological or management capacity</td>
<td>Cost of production and transportation</td>
</tr>
<tr>
<td></td>
<td>Presence on the market of competitors</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strategic Asset Seeking</th>
<th>Efficiency Seeking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merging to face strong competitors</td>
<td>Exploit differences in factor endowments, cultures, market structures and institutional arrangements</td>
</tr>
<tr>
<td>Access to distribution channels</td>
<td>Exploit differences in consumer tastes and supply capabilities</td>
</tr>
</tbody>
</table>

Source: Own figure based on Dunning (1993).

The first possible motive is resource-seeking. Resource seeking enterprises invest abroad to acquire certain specific resources that cannot or only at higher cost be obtained in their country of origin. Those investments may be further distinguished by the type of resource which the firm desires to exploit. First, physical resources like minerals, raw materials, agricultural products etc. that are needed for the production process of international firms where investors are trying to acquire the necessary inputs at a low cost or to secure the sources of supply. Examples for these resources are oil, copper, tobacco, sugar, rubber etc. Second, the seeking of a supply of cheap labor. These engagements are undertaken largely by manufacturing firms that produce labor intensive products and are based in countries with high cost of labor. Examples for this kind of FDI are the labor intensive U.S. maquiladora production facilities in the north of Mexico or the production of textiles in low labor cost nations in the far east or Latin America. Third, firms may be interested in an acquisition of technological capacity or management.

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69 See Dunning (1993) p.56. In this chapter he presents 3 other reasons for FDI flows: escape investments, support investments and passive investments that have been left out by the author due to their lesser theoretical importance.
expertise. Examples for investments of this category are the alliances in R&D between MNEs from industrialized countries in the information technology sector.

Enterprises that invest abroad to supply the local market or the market of neighboring countries with their products are called "market seekers". First, market seeking may occur because the firm has to follow its main suppliers or customers to the foreign market. An example for this kind of investment is the increased number of cross border mergers and acquisition in the accounting, auditing and consultant sector with the objective of being able to offer a global service to multinational clients. Second, a motive for market oriented FDI is the fact that many products need to be adapted to local tastes and needs. This kind of presence on foreign markets is of particular importance for firms selling consumer goods like food, soft drinks or clothes where tastes vary considerably in different local markets. Third, a reason for the presence on local markets is the trade-off between economies of scale in production and transportation as well as transaction costs. If certain products, the transportation cost of which are high, can be produced efficiently in small scales, firms have higher incentives to be present in the destination market of these products. Eventually, "market seekers" may consider it as an important part of their international strategy to be present in important regional markets dominated by their competitors.

The motivation of efficiency seeking FDI flows is to rationalize the structure of established resource based or market seeking investment. There are two kinds of efficiency seeking investments. First, firms want to exploit different factor endowments. This implies that capital intensive products will be produced in developed and labor intensive products in developing countries. Second, the potential motive of the investment may be a reaction to different consumer tastes and supply capabilities of different markets and therefore not based on differences in traditional factor endowments. Such efficiency seeking usually becomes important, when a minimum level of market- and resource-seeking FDI has already been attained.

The final motive for FDI is the acquisition of strategic assets to promote the long-term competitiveness of international companies. The main motive of strategic investments is not to acquire precise advantages in production cost or marketing but to add assets to the firm portfolio that will strengthen their overall strategic position. It is for example imaginable that two companies merge to face the strong competition of a main competitor. Another realistic example might be the acquisition of a company to gain control of its distribution channels.

Summarizing, the expansion of a firm's activity to other countries can have various reasons. Therefore, it is difficult, if not impossible, to formulate an all-embracing theory capable of determining the driving forces of FDI activity. Although such a theory is desirable, it would always remain incomplete
because it could not be applied to all kinds of FDI projects. As the determinants of FDI decisions vary considerably between industries and economic sectors a theoretical approach to explain FDI can only cautiously formulate a paradigm that is capable of providing a basic analytical framework for explaining FDI.

The eclectic paradigm seeks to offer a general framework for determining the extent and the pattern of foreign production by a country's own enterprises and the domestic production owned by foreign enterprises. The paradigm is a positive approach that helps to explain the observable behavior of MNEs and accepts much of the results of neo-classical trade theory which explains the spatial structure of output by differences in factor endowments. Following this approach the international specialization of countries is a result of their relative factor endowments. However, approaches built on the theory of competitive advantages cannot explain the ownership structure of international output since in traditional theory the different factor endowments would simply intensify international trade. The fact that foreign firms own domestic firms remains unexplained by this approach.

The eclectic paradigm starts from the existence of two kinds of market imperfections that allow for understanding why firms take part in international production. First, a structural market failure that discriminates between firms in their ability to gain and sustain control over property rights or to govern multiple and geographically dispersed value-added activities. Since firms are not, as neo-classical theory assumes, economic entities with identical production functions, in oligopolistic or monopolistic markets firms may possess advantages that competitors lack allowing them to face the competition of their local counterparts. In other words, to be successful firms investing abroad must possess some kind of innovatory, cost, financial or marketing advantages that are exclusive to the investing firm and that cannot easily be adapted by local firms. The market failure that allows the keeping of firm specific advantages over time is a prerequisite of FDI. The second necessary market failure is transactional, that is, it is located on the markets for intermediate products and services. Firms choose the organizational structure of their engagement by weighting the cost of using the market or internal hierarchies for the trade of these intermediates. If the transaction costs of a market solution are too high firms are widening their degree of vertical or horizontal integration which can also imply the engagement in international production. This transactional market failure explains why firms choose FDI as

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70 The following paragraph is, if not cited otherwise, based on Dunning (1993) p.76-86.
71 An explanation of the HOS-theorem can be found in every textbook of international economics. For the original papers see Heckscher (1950) and Ohlin (1933).
72 This argument builds upon the work of Hymer (1990) and Hymer (1976) who argues that firms that engage in foreign countries need to possess some ownership-specific advantages to make up for the informational disadvantages vis-a-vis domestic firms.
a strategy of internationalization instead of serving foreign markets via exports or contractual arrangements.  

Starting from these basic convictions DUNNING identifies three conditions that have to be simultaneously fulfilled for a firm to engage in FDI. First, the possession of certain assets that are not or only at higher cost available to their domestic competitors. These assets, may they be tangible or intangible, are capable of generating a future income stream. Examples for tangible asset that offer this possibility are qualified labor, capital or natural endowments. Intangible assets can be access to technology or information as well as marketing or organizational skills. The assets that are specific to a firm are labeled ownership-specific assets or O-advantages. The possession of O-advantages is a necessary condition for a MNE to engage in FDI.

Nevertheless, it still has to be explored why firms, that own O-advantages do not serve foreign markets with exports. As well as there are certain assets that are specific to a firm there are assets that are specific to a particular location. These kinds of advantages will henceforth be referred to as L-advantages and MNEs that want to exploit these assets have to be present in host countries. L-advantages can take various forms, as for example natural factor endowments or cheap labor as well as a stable political environment for production or other favorable country characteristics. Thus, the second requirement for FDI is the existence of a L-advantage in the potential host country.

However, the simultaneous existence of L- and O-advantages is not a sufficient condition for FDI because for exploring L-advantages it would be sufficient to integrate the company into international production via the market. Instead of taking the risk to make an investment abroad it could be advantageous to explore the L-advantages through buying cheaper inputs on foreign markets or letting foreigners produce via licensing. The third and last condition that has to be fulfilled before a company engages in FDI is the existence of transactional market failure. The main argument is drawn from internalization theory which has been reviewed above. For some reasons the use of the market as a coordination mechanism may be more expensive than the coordination by internal hierarchies. In this case it is the inability of the market to organize a satisfactory outcome for potential contractors and contractees of intermediate products that explains why firms choose the hierarchical route for exploring the differences in L-specific assets between countries. In other words, this kind of failure reflects the inability of the market to organize transactions in an optimal way. The reason for market failure may

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73 This argument has been pushed forward by authors that follow the internalization theory that was presented in paragraph 2.2.3.2. However, this argument is not specific for the decision to engage into international production as it goes back to the analysis of the firm by Coase who identified transaction cost as being responsible for the existence of firms in market economies. See Coase (1937).

74 This volume is an analysis of the location specific assets of countries. Grosse (2003a) argues that the eclectic paradigm is a suitable theoretical framework for the analysis of FDI to Latin America.
be asymmetric information that eventually leads to problems of hold up, adverse selection or moral hazard as well as imperfections of the international capital market that makes vertical or horizontal integration more attractive. Whatever the nature of the market failure, firms choose integration to maximize the net benefits of lower production, transaction or governance cost or to reap the maximal rent from the O-advantages they possess. The advantages that a firm acquires by internationalization through hierarchies instead of the market are henceforth referred to as Internalization-advantages (I-advantages).

The implications of the eclectic paradigm are straightforward. At any moment in time the more one country's enterprises relative to those of other locations possess O-advantages, the more they have an incentive to internalize rather than using the market, and the more they are interested in exploiting the differences in location specific assets the more they are likely to engage in outward production. This means that enterprises only engage in FDI, if all three conditions that are summarized in figure 2.18 are simultaneously fulfilled.

**Figure 2.18: Internationalization in the OLI-Paradigm**

<table>
<thead>
<tr>
<th>FORM OF INTERNATIONALIZATION</th>
<th>O-Advantage</th>
<th>I-Advantage</th>
<th>L-Advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDI</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Exports</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Contractual Arrangements</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Source: Own figure following the classification of Dunning

To sum up, the combination of the aforementioned advantages in a given investment project determines the form of internationalization a firm eventually chooses. The analysis highlights that location specific assets of host countries play an important role for the investment decision of MNEs. When in turn, location specific assets are a decisive determinant for the decision of MNEs over their spatial distribution of production it follows that countries without L-specific advantages cannot attract FDI. The aggregate location specific advantage of a given country is influenced by various variables as for example the existence of resources, factor costs, and human capital formation. Besides these determinants the local investment climate, a proper protection of property rights, the absence of corruption as well as the existence of rule of law and political stability are variables that positively affect the investment decision of MNEs. High levels of political risks may outweigh other location specific advantages as the existence of natural resources, cheap labor, or low taxes. Summing up, the eclectic paradigm permits to theoretically derive potential location specific determinants of FDI which can be empirically tested with statistical models.
2.2.4 Empirical Studies of Aggregate FDI

2.2.4.1 Overview

The analysis of O-specific and I-specific advantages is an important topic for transaction cost economics and studies in industrial organization with a fruitful area for empirical research on the firm level. However, given the topic of this analysis and the focus on the macro-level, it is obvious to focus on the analysis of location specific advantages of developing countries to assess their attractiveness for FDI. Due to the importance of FDI flows for developing countries, it is important to analyze which location specific variables have an important impact on incoming FDI flows since studying the determinants of FDI decisions allows for conclusions about the design of economic policy.

Empirical economic research identifies many potentially influential determinants of aggregate FDI by analyzing investment flows to countries or country samples. Although the literature offers a great number of econometric studies about the determinants of FDI, their findings remain to a large extent ambiguous. Due to the wide range of perspectives, methods, samples and analytical tools there is no consensus about the relative importance and the direction of the potential location specific determinants of FDI. Moreover, econometric models often contain variables which lack a sufficient theoretical foundation but provide a good fit of the model for the analyzed sample. As the empirical literature on determinants of FDI is too large to be completely reviewed, only recent contributions are presented in this paragraph.75

The discussion of theoretical models explaining FDI concluded that there is no all embracing theory of FDI, from which potential determinants for empirical tests could be clearly derived. Furthermore the variety of motives for firms to take part in international production make econometric studies of aggregate FDI a difficult task, the results of which have to be interpreted with caution. 76 In addition location specific assets of countries differ widely making empirical tests with cross-country samples even more difficult. Nevertheless, theoretical plausibility and empirical evidence concerning the most influential potential determinants of FDI will be briefly discussed because despite of its drawbacks econometric analysis remains a powerful tool for the empirical analysis of FDI flows and alternative approaches are still missing.

2.2.4.2 Empirical Determinants of FDI

This paragraph reviews recent empirical evidence in the literature concerning the impact of potentially theoretical determinants of FDI. Table 2.3 summarizes these findings by depicting the impact of potentially influential location specific variables and the significance and sign of calculated coefficients. Moreover, the robustness of all potential determinants is assessed by reviewing the

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75 See the more complete overview of Chakrabarti (2001).
76 Kwon (2002) argues that the ambiguous results of the empirical literature on FDI stem from the fact that many studies focused on aggregate FDI. For attaining better results he proposes to focus research on the project level.
impact and significance of the variables in different empirical investigations with different methodologies.\textsuperscript{77}

Table 2.3: Empirical Evidence on Potential Determinants of FDI

<table>
<thead>
<tr>
<th>Analyzed Variable</th>
<th>Positive Impact</th>
<th>Negative Impact</th>
<th>Insignificant</th>
<th>Robust</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kravis/Lipsey (1982)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Schneider/Frey (1995)</td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>Culem (1988)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wheeler/Mody (1992)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sader (1993)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Tsai(1994)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shamsuddin (1994)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Billington (1999)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Openness measured by Trade-GDP-Ratio or other variables</td>
<td>Kravis/Lipsey (1982)</td>
<td>Wheeler/Mody (1992)*</td>
<td>Convincingly</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Culem (1988)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Edwards (1990)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Host Country Infrastructure (Various Indicators)</td>
<td>Billet (1991)</td>
<td></td>
<td>Fully</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wheeler/Mody (1992)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Loree/Guisinger (1995)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Harms (2000)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Stein/Daude (2002)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor Cost measured by Host Country Wage Rate</td>
<td>Swedenborg (1979)</td>
<td>Schneider/Frey (1985)</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lucas (1993)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shamsuddin (1994)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human Capital of the National Workforce</td>
<td>Frey (1994)</td>
<td></td>
<td>Fully</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Schneider/Frey (1985)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Billet (1991)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Host Country Tax Rate</td>
<td>Swenson (1994)</td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loree/Guisinger (1995)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Cassou (1997)</td>
<td></td>
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<td></td>
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<td>Kemsley (1998)</td>
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<tr>
<td></td>
<td></td>
<td>Billington (1999)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Host Country Barriers to Trade</td>
<td>Lunn (1980)</td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jun/Singh (1996)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Culem (1988)</td>
<td></td>
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<tr>
<td>Host Country Exchange Rate</td>
<td>Edwards (1990)</td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Froot/Sten (1991)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Blonigen/Feenstra (1996)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Host Country Growth Rate</td>
<td>Lunn (1980)</td>
<td></td>
<td>Convincingly</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Schneider/Frey (1995)</td>
<td></td>
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<td>Culem (1988)</td>
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<td>Billington (1999)</td>
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<td>Shamsuddin (1994)</td>
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<tr>
<td></td>
<td>Tsai (1994)</td>
<td></td>
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</tr>
</tbody>
</table>

Source: Own Table, *The Wheeler/Mody Study is cited two times because they find different results for different sub-samples.

\textsuperscript{77} Variables where the empirical evidence is clear are classified as fully robust while variables where the majority of studies find the same sign with a significant coefficient are considered as convincingly robust.
One of the most cited potential determinants of FDI is the market size of the host country. Recalling the market-seeking motive it seems plausible that the size of the destination market significantly influences the investment decision of MNEs. In addition efficiency seeking enterprises may find a better possibility to explore economies of scale in larger host markets.

Therefore, a proxy for market size can be found in nearly all empirical studies of FDI, the most popular ones being GDP or GDP per capita. The empirical evidence for a positive impact of market size, proxied by GDP, on FDI is overwhelming.\textsuperscript{78} Thus, recent empirical evidence supports the theoretical assumption that incoming FDI is positively correlated with the size of the host country market. Moreover, market size turns out to be a robust determinant as the positive impact of this variable is confirmed by all reviewed empirical studies.

Likewise, there is good theoretical evidence concerning the influence of variables that measure the degree of openness of countries. Openness and investment flows should be positively correlated when FDI is concentrated in the tradable sector. Although the empirical evidence for the hypothesis is not clear cut, there are various empirical results that indicate a positive correlation of openness and FDI.\textsuperscript{79} Therefore, openness is considered a convincingly robust determinant of FDI.

It is often argued in the literature that in developing countries the quality and the extent of the host country infrastructure are important determinants of incoming FDI flows. As the quality of the local infrastructure directly affects costs associated with the factors of production, the production process and the distribution of the products this argument is theoretically convincing. Empirical studies confirm the hypothesis that infrastructure development is an important criterion for FDI in developing countries indicating that infrastructure variables are robust determinants of FDI.\textsuperscript{80}

Another theoretically important determinant of FDI is the cost of labor in the host country. As pointed out before a cheap labor supply or other low factor costs are potential determinants of FDI since resource seeking MNEs typically invest in developing countries with low wages or other factor costs to decrease production costs. In particular when products have already attained a significant level of maturity factor costs become important location specific determinants.\textsuperscript{81} Even if theory predicts a negative correlation between variables measuring labor costs and FDI, empirical evidence remains mixed. Results range from a negative or insignificant impact to an even positive

influence of labor costs on FDI. Although host country labor costs are theoretically an important location specific determinant of FDI, the reviewed empirical studies do not confirm the theoretical prediction indicating that wages are no robust determinant of FDI.

Immediately related to the influence of host country labor costs are the skills of the national workforce. When low levels of qualification and skills of the workforce imply low labor productivity, location specific advantages of low wage countries may be offset completely. Therefore, a measure of human capital should theoretically have a positive correlation with FDI. Several empirical studies confirm the hypothesis that the greater the availability of a skilled workforce the greater the flow of FDI. Hence, the existing empirical evidence indicates that human capital of the national workforce is a robust determinant of FDI.

The literature also investigates if FDI flows are sensitive to a host country's tax rates. As low taxes are location specific advantages that efficiency seeking international enterprises can exploit, economic theory suggests a negative correlation between host country taxes and incoming FDI. Empirical evidence however, remains ambiguous. Although some empirical studies find the expected negative correlation, there is also a great number of studies that do not find a significant impact and reject the hypothesis. To conclude, the ambiguous empirical evidence on the influence of taxation on FDI does not permit the classification of taxes as robust determinants of FDI.

The theoretical impact of variables measuring trade barriers of host countries on FDI is unclear. Following the tariff hopping argument a high degree of protection in the host country will imply an increase in FDI as foreign companies are trying to avoid high tariffs. In turn, an excessive protection of the host country market may deter FDI, when investors are export oriented or heavily rely on imports of intermediary goods. The review of empirical studies on the effects of trade barriers likewise is inconclusive. While some authors find empirical evidence for the "tariff hopping" argument, there are also studies that reject it. Therefore, trade barriers cannot be classified as robust determinants of FDI.

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82 See Culem (1988), Sader (1993), Shamsuddin (1994) and Tsai (1994) who found a negative impact of wages on FDI. See the studies of Swedenborg (1979) and Wheeler/Mody (1992) that obtained a positive impact.

83 Another important problem immanent to empirical studies of the impact of labor costs is the lack of sufficiently large comparable time series on labor costs in particular for developing countries, which suggests a sample selection bias of existing studies. Another problem of the empirical studies is that instead of unit labor costs national wage rates are used.


86 See Lunn (1980) and Jun/Singh (1996) that accept the tariff hopping argument. For a rejection or an insignificant impact see Culem (1988) and Blonigen/Feenstra (1997).
Another potential determinant of incoming FDI is the evolution of the host country’s exchange rate. Following the exchange rate-hypothesis countries with a weak or volatile exchange rate will receive less FDI because asset values and income streams from countries with a weak currency are subject to large devaluation risks. Therefore, income streams will be discounted at higher rates when they originate in countries with weak currencies. In turn, a weak host country currency may also attract FDI because acquisition prices for foreign investors are falling. As the empirical evidence remains mixed, it follows that the exchange rate cannot be classified as robust determinant of FDI flows.\(^\text{87}\)

There is also mixed econometric evidence with respect to variables that measure the economic dynamics of host countries. Following the growth hypothesis rapidly growing economies provide better opportunities for making profits and attract more FDI. Although many econometric studies seem to confirm the hypothesis, the variable does not turn out to be robust in all settings.\(^\text{88}\) Nevertheless, the review of recent empirical studies permits to classify the variable as being convincingly robust.

Another dynamic variable, the impact of which on FDI has been discussed in the literature, is the current account balance. Following the trade-surplus hypothesis a positive current account is a characteristic of a healthy and dynamic economy with export potential. Therefore, a trade surplus should exert a stimulating impact on FDI. However, empirical tests of this hypothesis are inconclusive. While several authors find the theoretically expected positive sign, some authors’ results indicate the opposite.\(^\text{89}\) In sum, the empirical evidence does not permit to classify the current account as a robust determinant of FDI.

In addition to these variables there is a great number of other potential determinants that have not been explicitly reviewed here. Particularly relevant for the purpose of this study is the existing empirical evidence on the influence of indicators measuring political stability or political risk. All these empirical studies however, are reviewed separately in paragraph 2.2.5.4. To conclude, only a few variables that are supposed to be potential determinants of FDI turn out to be robust in a large number of empirical studies implying that the significance of many determinants depends to a large extent on the design of the econometric model and the selected sample. This empirical ambiguity implies that up to now the economic literature does not offer a widely accepted standard model for econometric research on FDI. Nevertheless, empirical

\(^87\) See Blonigen/Feenstra (1997), Froot/Stein (1991) that find a strong negative correlation of the exchange rate and FDI. Insignificant or positive effects were found by Edwards (1990), Sader (1993) and Tuman/Emmert (1999).


evidence suggests that market size, openness, infrastructure, human capital of the workforce and host country growth rates are convincingly or fully robust determinants of FDI flows. In turn, other potentially influential variables being reviewed in this paragraph as host country wages, taxes, the exchange rate and tariffs are not robust to minor changes in the specification of empirical models.  

2.2.5 Political Risk and International Investment

2.2.5.1 Definition of Political Risk

Since the term “Political Risk” is used in various economic publications without precise definition, this paragraph provides a definition of political risk that is based on a review of the existing literature and will be used throughout the present analysis. It was already pointed out that neoclassical investment theory assumes that all actors are fully informed. Uncertainty, in turn, occurs in a world without full information and in reality, economic actors are daily confronted with various forms of uncertainty. Recalling the analysis in Chapter 2, introducing uncertainty did not necessarily imply a risk for the decision maker. Only if an actor has to make ex ante decisions which are not, or only at high cost, reversible a risk occurs because current decisions directly affect future earnings. Therefore, risk can be broadly defined as uncertainty over future developments affecting future returns of economic actors.

In the economic literature the definitions of political risk vary largely with the underlying unit of analysis. HOWELL/CHADDICK define political risk as the possibility that political decisions, events or conditions in a country will affect the business environment such that investors will lose money or have a reduced profit margin. LESSARD defines political risk for foreign investors as the risk of political discontinuities resulting in losses through expropriation or major policy shifts. Other definitions may be classified in two groups. The first group solely focuses on governmental action as a source of political risk. The second group of definitions also includes sources of risk which are outside the direct control of the host government. For foreign investors political risk can be a combination of both, a government’s inclination to opportunistically interfere in operations and the presence of societal factors as civil strife or ethnic tensions. Therefore, here political risk is defined in a broader sense which also includes risks that do not emanate directly from governmental action. Speaking of political risk in this volume refers to uncertainty about the future interference or non-interference of governments as well as abrupt changes or discontinuities in policy affecting the revenues from or the value of private assets. The notion of “non-interference of governments” covers all those risks that are caused by an insufficient action of public administrations or

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90 These findings have implications for the methodology of the empirical analysis in Chapter 4. See paragraph 4.2.1.
91 See paragraph 2.1.3.2.
92 Simon (1982) offers an overview of earlier definitions of political risk.
RISK IN THE THEORY OF INVESTMENT

that do not originate in governmental action at all. Examples are lack of public order, riots, strikes or revolution which clearly affect returns on investment but do not originate directly in governmental action. In addition, all those political risk factors are covered which affect the return of investors due to international political tensions. Cross country warfare or terrorist attacks are examples for exogenous risks that are not caused by governmental behavior. In this sense political risk occurs, if the government is not able to fulfill the tasks of ensuring that firms can follow their normal economic activities.\(^9\) Related to the term political risk is the term country risk. Since this term usually refers to the risk that an international loan defaults, it should not be confounded with political risk in general.\(^9\) Consequently LESSARD defines general country risk as the risk of change in an asset's value due to sovereign policy that involve general or selective default on, confiscation of or taxation of claims in response to circumstances under which either or both the ability and willingness of the sovereign to meet all the claims placed on it is impaired.

It is important to stress that it is not only the existing set of regulations, restrictions and institutions that may reduce the attractiveness of countries for FDI. Governments can impose taxes on cross-border financial flows and payments, quantitative limitations or reserve requirements independently from the current status quo. Therefore, also the time dimension of the problem and the expectations of investors have to be considered. Independent from the existing political institutions the mere possibility of measures that reduce the investor's returns already implies a political risk.\(^9\) Given the irreversibility that is inherent to the majority of investments, it seems evident that investors are rather concerned about the government's future policy than about the past.\(^9\) It is straightforward to see that the aforementioned definition contains a large quantity of governmental action or non-action that may possibly affect the return on private assets. However, the term political risk is only applied to situations where the declining value of private assets is due to a change of the property rights structure. This excludes all political action which decreases the value of private assets indirectly and not specifically as for example the general design of fiscal or monetary policy.\(^9\) Furthermore, this definition ignores all kinds of economic risks that may affect the returns of MNEs due to evolutions on international markets. Examples are changing terms of trade, variations in international interest rate, a global reduction in demand, and increases in oil prices and so on. It is important to stress that political risk may also arise although the existing *de jure* property rights structure of a society

\(^9\) The author is well aware of the fact that there is no consensus about the tasks of the state in a market economy. Chapter 3 delivers a more detailed discussion of necessary governmental tasks.


\(^9\) This exclusion is only valid for a "normal course" of economic policy that does not lead to economic or financial crisis. Economic policies that lead to severe macroeconomic imbalances are a potential source of political risk. The weakness of this definition is to distinguish "normal" policy from a "false" policy leading to economic crisis.
remains unchanged. If for example the de facto structure of property rights is significantly changed by problems of contract enforcement, political risk emerges. Henceforth, aggregate political risk is defined as the sum of possible exogenous and endogenous risk factors where uncertainty about future governmental action or non-action as well as abrupt changes or discontinuities decrease the value of private assets due to an alteration of the property rights structure.

2.2.5.2 Categories of Political Risk and Anecdotal Evidence

The last decade saw an enormous increase of private capital flows to developing countries. This growing internationalization of capital markets and the experience of several emerging market crises during the 90s made the evaluation of country risk and political risk a leading issue in the world of international finance. However, already the expropriations of resource extracting foreign facilities in developing countries during the 30s, 60s and 70s made international investors aware of political risks as a relevant determinant of investment decisions. As a reaction to the suffered losses MNEs aimed at removing the contractual relationship with developing countries from the supremacy of local laws, by requiring that the contract be governed by general principles of international law recognized by civilized nations. However, various attempts to conclude multilateral conventions on the subject of foreign investment protection, such as most recently the Multilateral Agreement on Investment (MAI) were unsuccessful.\(^\text{101}\)

Moreover, the high relevance of political risks as a problem of international finance is reflected by the specialization of several public organizations in risk bearing and forecasting on the national and multinational level as well as by the large sums covered by political risk insurers. By 1998 new coverage issued by members of the Berne Union for political risk insurance reached an amount of 42 billion US$.\(^\text{102}\) When compared with the total volume of world wide FDI of 644 billion US$ for the same year, this figure underlines the importance of the political risk insurance sector. In addition to these public efforts the last years witnessed the emergence of a large private market for the insurance of political risks. In the last decade this market saw a fast growth of private insurance companies offering innovative solutions for private investors willing to invest in foreign markets that are perceived as risky.\(^\text{103}\) Responding to the large demand private insurers considerably increased their confiscation, expropriation, nationalization insurance capacity (CEN) per project over the last years. The market leader Lloyd's of London for instance pushed its CEN to

\(^{101}\) These contractual solutions began to flaw when developing countries proclaimed a ,,New International Economic Order" claiming the sovereignty of each state to regulate foreign investment and to nationalize foreign property. See Bemandini (2001) p.236-238.


\(^{103}\) See Bennmansour/Vadcar (1995) p. 149-170, West/Martin (2001a) and West/Martin (2001b). Most political risk insurance contracts focus on developing countries.
900 million US$ for the year 1999.\textsuperscript{104} Besides their demand for political risk insurance recent research shows that most MNEs are simultaneously active in in-house political risk assessment.\textsuperscript{105} The interest of private investors in organizations that bear parts of their foreign investment risks leads to the conclusion that political risk is a major impediment of international capital flows to developing countries. On the multilateral level organizations like the Multilateral Investment Guarantee Agency (MIGA) and the International Finance Corporation (IFC) are aware of this problem and offer solutions for investors willing to engage in developing countries or emerging markets with a high level of risk. While the previous chapter provided a theoretical definition of the term political risk, this paragraph is concerned with the different categories of political risks that may affect MNEs. Following SIMON political risk may be categorized by using three main characteristics. These criteria for classifying risks and real world examples for the resulting categories of risk are depicted in figure 2.19.

**Figure 2.19: Typology of Political Risks**

<table>
<thead>
<tr>
<th>Macro Risks</th>
<th>Micro Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Societal-related</td>
<td>Governmental-related</td>
</tr>
<tr>
<td>Revolution</td>
<td>Nationalization</td>
</tr>
<tr>
<td>Wars</td>
<td>Expropriation</td>
</tr>
<tr>
<td>Coups d'états</td>
<td>Creeping expropriation</td>
</tr>
<tr>
<td>Violence</td>
<td>Repatriation restrictions</td>
</tr>
<tr>
<td>Civil Unrest</td>
<td>Change of Public Priorities</td>
</tr>
<tr>
<td>Widespread riots</td>
<td>Change of Party</td>
</tr>
<tr>
<td>Nationwide Strikes</td>
<td>Change of Government</td>
</tr>
<tr>
<td>Shifts in public opinion</td>
<td>Change of Ministers</td>
</tr>
<tr>
<td>Union activism</td>
<td>Corruption</td>
</tr>
<tr>
<td></td>
<td>High inflation</td>
</tr>
<tr>
<td></td>
<td>Level of Public Spending</td>
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<tr>
<td></td>
<td>Exchange Controls</td>
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<td></td>
<td>Labor Market Policy</td>
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<tr>
<td>Cross-National Guerilla</td>
<td>Warfare</td>
</tr>
<tr>
<td>International terrorism</td>
<td>Border conflicts</td>
</tr>
<tr>
<td>World public opinion</td>
<td>Alliance shifts</td>
</tr>
<tr>
<td>Disinvestment pressure</td>
<td>Embargoes</td>
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<tr>
<td></td>
<td>International boycotts</td>
</tr>
<tr>
<td></td>
<td>Protectionism</td>
</tr>
<tr>
<td></td>
<td>Unsustainable external debt</td>
</tr>
<tr>
<td></td>
<td>International economic instability</td>
</tr>
<tr>
<td></td>
<td>International activists</td>
</tr>
<tr>
<td></td>
<td>Selective international terrorism</td>
</tr>
<tr>
<td></td>
<td>International boycott of firm</td>
</tr>
<tr>
<td></td>
<td>Diplomatic stress between host and home country</td>
</tr>
<tr>
<td></td>
<td>Bilateral trade agreements</td>
</tr>
<tr>
<td></td>
<td>Multilateral trade agreements</td>
</tr>
<tr>
<td></td>
<td>Selective Import/export restrictions</td>
</tr>
<tr>
<td></td>
<td>Foreign government interference</td>
</tr>
</tbody>
</table>

Source: Own figure based on Simon (1982) p.67.

\textsuperscript{104} See the overview by West (2001) p.52-58, West/Martin (2001a) p.139-145 and West/Martin (2001b) p.207-230.

\textsuperscript{105} In a survey of US multinationals Hashmi/Guvenli (1992) find that all respondents at least occasionally engage in political risk analysis. Over 50% of the multinationals have a regular (yearly or quarterly) political risk assessment pattern. In the words of a leading manager; "[Host country] governance is as important as value." Cited in Henisz/Zelner (2003a) p.2.
First, the source of political risks can be either exogenous or endogenous to the political process in a given host country. Cross national warfare, for example, is an exogenous risk factor while civil strife is an endogenous risk. Second, political risks can be related to governmental action like expropriations or rather to societal events like strikes or riots. Third, political risk may affect all firms in the host country (macro-risk) or just specific firms (micro-risks). It follows that aggregate political risk is shaped by endogenous and exogenous risk factors which may differently affect firms present in the host country. Although figure 2.19 suggests that political risks can be precisely categorized, in reality all these different sources of political risk are interdependent.

Figure 2.20 shows the possible interactions of endogenous and exogenous political risk factors and gives real world examples for the interaction of these two risk types.

**Figure 2.20: Dimensions of Aggregate Country Risk**

<table>
<thead>
<tr>
<th>Nature of Exogenous Risk Factors</th>
<th>Not significant</th>
<th>Sector-specific</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not significant</td>
<td>No Risk</td>
<td>Shift in regulation</td>
<td>Breakdown in Public</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Targeted expropriation</td>
<td>Order</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Creeping Expropriation</td>
<td>General Expropriation</td>
</tr>
<tr>
<td>Sector-specific</td>
<td>Commercial Losses on firm-level</td>
<td>Creeping Expropriation through Windfall Taxes</td>
<td>More of the same</td>
</tr>
<tr>
<td>General</td>
<td>Economy-wide Commercial Losses</td>
<td>Commercial Losses</td>
<td>Economy-wide Total Loss</td>
</tr>
</tbody>
</table>

Source: Lessard (1993) p.453

Both figures highlight that political risks are far from being homogenous. Instead, investors face such diverse forms of risks as wars, expropriations, strikes, shifts in regulation and so on. It follows that political risk is a complex multidimensional phenomenon implying that suitable political risk indicators have to contain several potential sources of risk. Furthermore, it is straightforward to see that even if an indicator pictures the main potential sources of risk in a given country, it can hardly be complete.

Another useful classification of political risk is provided by SCHIFFER/WEDER who distinguish between catastrophic and creeping political risk. The term catastrophic political risk refers to the classical risks that a host government expropriates the investor without offering compensation or that other catastrophic circumstances like wars, coups or civil unrest imply the total loss of private assets. This risk is usually closely related to significant changes in political power implying major policy changes. Creeping political risks or creeping expropriations in turn, contain all forms of unexpected changes in the
institutional framework that reduce the value of private assets without resulting in a total loss of the title on private property. In other words, a creeping expropriation does not result in a formal dispossession of property by its owner. Instead, a creeping expropriation implies that governmental actions as for example regulatory policy reduce the profits of private assets by slowly diluting property rights. For a better understanding of the latter consider the example of an infrastructure investment which is subject to national regulation. By altering the conditions of regulation the government possesses a powerful tool to reduce the profits of private investors. As those investors cannot easily withdraw, the governments have a strong incentive to act opportunistically by ex-post changes of taxes or regulations. This incentive to exploit the investor by altering the relevant framework, ex-ante becomes a disincentive for companies planning an investment. While from this point of view a long-term commitment of the regulating body is desirable, one has to be aware of the problem that the benefit of a short term commitment is the flexibility to rectify wrong decisions of previous administrations. Faced with the large variety of political risks it is interesting to identify those political risk which are of particular importance for international investors. The easiest way to do so is to analyze for which kinds of political risks there is a demand or an offer of insurance contracts on the international political risk insurance market. For its guarantee and insurance business MIGA offers four big categories of political risks insurance contracts which are depicted in figure 2.21.

The risk of War and Civil Disturbance means that private assets are affected by a loss from, a damage to, or the destruction or disappearance of, tangible assets caused by politically-motivated acts of war or civil disturbance in the host country, including revolution, insurrection, coups d'etat, sabotage, and terrorism. Protection against war and civil disturbance also extends to events that, for a certain period, result in an interruption of project operations essential to overall financial viability. This type of business interruption is effective when the investment is considered a total loss. A good example for firms being affected by revolutionary disturbances are the U.S. firms based in Iran under the leadership of the U.S. friendly shah. Used to the former friendly policy

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108 As a leading manager put it: "... If there is regulated price, the price will be used for political purposes. If anyone assumes that there will be no changes it is naive. It is more than naive, it is stupid...." Cited in Henisz/Zelner (2003b). There are many contributions in the literature which analyze the "bargaining power" of multinational firms relative to host country governments. Already Vernon stressed that governments have an incentive to renege on initial contracts when multinationals capital is sunk and its technology has diffused locally. As Vernon puts it: "As long as a foreign-owned goose can still lay golden eggs, ... the policy of most developing countries has been to squeeze the goose, not to destroy it or to have it fly away. Accordingly, multinational enterprises that perform a unique function, such as providing access to some difficult technology or some otherwise inaccessible foreign market, have generally been less vulnerable to government pressures, while subsidiaries whose withdrawal is thought to entail very little national loss have been more vulnerable." Cited in Henisz/Zelner (2003b)


110 See MIGA (2002).
towards foreign firms they were strongly affected by the riots and civil disturbances preceding the Iranian Revolution. More recently one can cite the losses of U.S. firms in Haiti or in former Yugoslavia that were due to civil strife.

**Figure 2.21: Categories of Political Risk Insurance offered by MIGA**

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>War and Civil Disturbance</td>
<td>Private assets are affected by a loss from, a damage to, or the destruction or disappearance of, tangible assets caused by politically-motivated acts of war or civil disturbance</td>
</tr>
<tr>
<td>Restricted Transfer of Profits</td>
<td>Loss of the investment as a result of acts by the host government that may reduce or eliminate ownership of, control over, or rights to the insured investment</td>
</tr>
<tr>
<td>Breach of Contract</td>
<td>Refers to losses arising from the host government's breach or repudiation of a contract with the investor</td>
</tr>
<tr>
<td>Expropriation</td>
<td>Transfer Restriction means losses arising from an investor's inability to convert local currency (capital, interest, principal, profits, royalties and other remittances) into foreign exchange for transfer outside the host country</td>
</tr>
</tbody>
</table>

Source: Own figure based on MIGA (2002).

With expropriation MIGA identifies the loss of the investment as a result of acts by the host government that may reduce or eliminate ownership of, control over, or rights to the insured investment. In addition to outright nationalization and confiscation, "creeping" expropriation, that is a series of acts that, over time, have an expropriatory effect, is also covered. MIGA insurance coverage is available on a limited basis for partial expropriation (e.g., confiscation of funds or tangible assets). Not covered are non-discriminatory measures by the host government in the exercise of legitimate regulatory authority. There are many historical examples for expropriations of foreign investors. The nationalization of the oil industry, the banking sector and the sulphur industry in Mexico. The nationalization of the International Petroleum Company and many other foreign firms between 1968 and 1975 by the Peruvian government or the wave of nationalizations under the presidency of Allende in Chile between 1970-1973. Another prominent example is the "Zairianization-Program" enacted by president Mobutu expropriating more than 1500 foreign-owned enterprises. A more recent example is the expropriation of white farmers in Zimbabwe under Mugabe.

Breach of Contract refers to losses arising from the host government's breach or repudiation of a contract with the investor. In the event of an alleged breach or repudiation, the investor must be able to invoke a dispute resolution mechanism (e.g., an arbitration) in the underlying contract and obtain an award for damages. If, after a specified period of time, the investor has not received payment or if the dispute resolution mechanism fails to function

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113 See MIGA (2002).
114 For a more detailed review of expropriations in Mexico see paragraph 5.1.2.2.
because of actions taken by the host government, MIGA will pay compensation.\textsuperscript{116} A historical example for a breach of contract is the case of Belco and Occidental, two oil corporations active in Peru. When Garcia was elected president in 1985 he forced the two companies to renegotiate their operating agreements on less favorable terms.\textsuperscript{117}

The risk of transfer restrictions refers to potential losses arising from an investor's inability to convert local currency (capital, interest, principal, profits, royalties and other remittances) into foreign exchange for transfer outside the host country. The coverage of MIGA insures against excessive delays in acquiring foreign exchange caused by host government action or failure to act, by adverse changes in exchange control laws or regulations, and by deterioration in conditions governing the conversion and transfer of local currency. Losses that are caused by currency devaluation are not covered. There are many historical examples for the imposition of transfer restrictions. During the 60s South Africa reacted with capital controls to the massive flight of capital following riots in major cities. In the aftermath of the peso devaluation during the debt crisis Mexico imposed foreign exchange controls.\textsuperscript{118} More recently China arbitrarily ended the allocation of foreign exchange to a Chinese-American joint venture for political reasons in 1989.\textsuperscript{119}

Summing up, the aforementioned examples as well as the large private and public offer for the insurance of political risks highlight the importance of this topic for the structure of international capital flows. Furthermore this paragraph underlined the importance of political risk analysis in the investment decision process of MNEs. The next paragraph reviews existing economic models of political and country risk.

\section*{2.2.5.3 Modeling Political Risks for International Investors}

\subsection*{2.2.5.3.1 Existing Models of Political Risks}

The anecdotal evidence from the previous paragraph illustrated how political risk may adversely affect international investors and borrowers. The economic modeling of such risks was given a lot of attention in reaction to the debt crisis at the beginning of the 80s. However, being the most important form of international capital flows at that time, most of the authors were concerned with debt flows. These models analyze problems that arise out of credit relations between developed and developing countries with a particular interest in the factors determining the default risk of countries. The main conclusion offered by these types of models is that the major problem of international lending is contract enforcement. As supranational institutions lack the power to ensure an efficient enforcement of international contracts, sanctions which are imposed on a country that defaults on its international debt are usually inefficient. To put it in other words, in international lending no mechanisms

\begin{itemize}
  \item \textsuperscript{116} See MIGA (2002).
  \item \textsuperscript{117} See Kennedy (1991) p.44-61.
  \item \textsuperscript{118} See Simon (1982) p.67.
  \item \textsuperscript{119} See Howell/Chaddick (1994).
\end{itemize}
exist that would allow for a credible commitment to repayment as it is the case for national debt contracts. Technically speaking host countries are confronted with a severe problem of time inconsistency, which means that the government has an incentive to ex post reverse its ex ante plans.

Compared to the abundance of literature on the impact of country risk or political risk on international lending there are fewer models that are concerned with the influence of political risk on international investment flows. Earlier models of political risk are mainly concerned with the question of how political risks emerge in host countries, and do not explain how political risks influence FDI flows. Despite of the distinct characteristics of debt and investment, the problem of time inconsistency in the sovereign debt models can also be extended to investment problems being aware of one major difference. A debt contract usually contains a set of formal rules which are agreed on by the contracting parties implying that deviations from the agreements can easily be identified although contract enforcement remains difficult. In the case of FDI there is a great variety of possible host government interference with private assets which may not be explicitly covered in a contract. This fact makes the identification and sanctioning of deviations more difficult and renders the problem of time inconsistency more severe for FDI. Despite of potential risks for foreign investors developing countries witnessed a growth of FDI inflows during the last decades. This, in turn, suggests that there must be at least indirect sanctioning mechanisms that prevent governments from the worst opportunistic behavior.

To explain this EATON/GERSOVITZ present a model assuming that expropriated investors will never invest again in the former host countries. As a reaction to opportunistic behavior of the host country government they consequently exclude it from foreign capital flows in the future implying that after an opportunistic deviation the host country exclusively relies on the domestic capital stock. One finds a similar line of argument in the more recent contribution of COLE/ENGLISH. Both models stress a "reputation effect" that reduces the incentive of governments to act opportunistically. Deciding over opportunistic behavior, governments have to consider the trade-off between the one time gain and the discounted future losses of their actions. So weighting the cost and benefits of an expropriation can prevent them from expropriating if the future losses are large enough.

Inherent to the argumentation of these two models is the fact that greater independence from other countries increases a government's incentive to act opportunistically because the autarchy cost of being excluded in the future is lower. The implicit assumption is that the cost of opportunistic behavior is de-

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120 For a review of the older literature see Eaton/Gersovitz/Stiglitz (1986).
121 See the overview in Oseghale (1993). This emergence of political risk is discussed in greater detail in paragraph 3.2.
creasing in the country's income and the size of the national capital stock. This, in turn, implies the awkward result that the risk of a country is growing in its level of development. Following this logic richer countries should turn out to be more riskier than poor countries which is clearly at odds with the existing empirical evidence that rather suggests the opposite. It follows that the cost of autarchy have to be influenced by more factors than just the national capital stock. Other sanctions that establish a positive correlation of income and cost of autarchy are reductions in the country's productivity, disruptions in its ability to trade or the seizure of assets or these assets' returns that a country holds abroad.¹²⁴

KONRAD models the expropriation risk of foreign investors as the result of a competition between investors and several competing government groups which lack supreme power to fully reallocate property rights.¹²⁵ In a recent paper JANeba uses a model in which investments can be made simultaneously in more than one country which do not only differ in terms of production cost but also in the degree of commitment power. In this framework MNEs face a trade-off between investing in a low-cost and low-credibility country on the one hand and a high-cost but high credibility country on the other hand. If the low credibility country cannot give a credible commitment to the existing tax rate the existence of a high credibility country allows the firm to produce in both countries or to hold excess capacity for strategic reasons. Doing so the firm can minimize the risk that the firm becomes a victim of opportunistic behavior in the low credibility country. Therefore, holding plants in politically stable countries reduces the firm's dependence on a single government. The power to shift production quickly reduces the influence of political risk on the amount that is invested. As expected lacking commitment of host governments leads to welfare-losses. Yet they are not due to mere under-investment but caused by the fact that the MNE produces and invest in the less cost efficient location.¹²⁶

2.2.5.3.2 Implications of General Investment Models
The previous paragraph reviewed a set of models which focused on the special characteristics of FDI to explain the impact of political risks on the investment behavior of MNEs. The approach offered here focuses on the decision making process of the foreign investor. To do so the effects of uncertainty on investment decisions that were analyzed in paragraph 2.1.3 have to be recalled. The presented models permit to derive the result that uncertainty reduces investment spending, when investment projects are irreversible. Although decisions about FDI differ from decisions about domestic projects, the characteristics of the investment decision process are similar because rational economic actors only invest if a considered project is advantageous.

¹²⁵ See Konrad (2001).
¹²⁶ See Janeba (2001).
Hence, similar to the process of investing in their home countries foreign investors base their decisions on a calculus designed to assess the profitability of the project. Therefore, the results which have been derived for general investment problems are also valid for international investment decision. This, in turn, means that also foreign investors will react with a reduction of investment spending when uncertainty increases and investments are irreversible. Hence, it may be argued that a rise in host country uncertainty will affect FDI in the same way as it affects domestic investment decisions. In addition foreign investors face an informational disadvantage vis-a-vis their local competitors which means that the influence of rising uncertainty should have an even stronger influence on foreign investors than on their domestic counterparts. Accepting the fact that political uncertainties negatively affect local investors it is plausible to argue that their foreign counterparts are likewise or even more affected. Therefore, the policy implications derived from the DIXIT/PINDYCK model are essentially valid for international investment problems.

Assume that a firm is planning to invest in a foreign country and that during the decision process it analyzes the aggregate risk of the project. Assume that $\sigma_A$ is the aggregate risk of the investment project which corresponds to the parameter that reflected uncertainty of expected payoffs in the DIXIT/PINDYCK model where higher uncertainty was characterized by a higher variance of future returns. Paragraph 2.2.5.1 defined political risk as uncertainty about the future interference or non-interference of governments as well as abrupt changes or discontinuities in policy affecting the revenues from or the value of private assets. To analyze how this type of risk influences the overall risk of the project I assume the possibility that every component of a project’s aggregate risk can be separately identified. The historical examples in the preceding paragraph showed that political risks often severely influence the return of investment projects and in many cases even imply a total loss of the invested assets. Let $\sigma_{PR}$ be the parameter measuring the influence of the level of political uncertainty in the host country on the planned project. Let the aggregate risk of a project $\sigma_A$ be the sum of different independent partial risks $\sigma_1 - \sigma_n$ and a product of this sum with general political risk affecting each independent risk of the project. The independent partial risks are determined by the characteristics of the project and the current situation on the world market. Hence, the sum of this independent partial risk reflects the inherent risk of the project without any intervention of the government or other non-economic events affecting its return. Political risk is an exogenous factor that may influence the profitability of the project independent from its inherent characteristics. The existence of political risk can imply that a project becomes disadvantageous that would be inherently profitable, if it was not affected by other exogenous risks. That is to say, if the project was realized in an environment that was perfectly stable its return would be positive. Exogenous political risk may arise in various forms. Expropriations, breach of contract, civil disturbances and other risk factors can imply a loss to the firm although the project in itself is profitable. For reasons of simplicity assume that $\sigma_{PR}$ is the
only source of political risk that has an influence on the independent inherent risks of the project. Hence, $\sigma_A$ can be written as:

$$\sigma_A = (\sigma_1 + \sigma_2 + \ldots + \sigma_n) \sigma_{PR}$$

or

$$\sigma_A = (\sum_{i=1}^{n} \sigma_i) \sigma_{PR}$$

where $\sigma_{PR}$ is a multiplier that can theoretically take every value between 0 and $\infty$ and captures the influence of aggregate political risk on the variance of a project's returns. It is straightforward to see from equation (2.27) that every change in the level of political risk immediately affects the aggregate risk of the project. If $\sigma_{PR}$ exceeds unity aggregate political risk is increasing the variance of the project's returns which implies a higher level of aggregate project risk for the investor. A parameter value of unity in turn, would imply that the existing level of political risk is not significant for the return of the project and its risk is solely determined by its inherent characteristics. In this situation investors can focus on real commercial project risks rather than on policy risks created by potentially adverse government actions. A parameter value of $\sigma_{PR}<1$ is at first sight less intuitive because it means that aggregate risk of the project is decreased by the existing level of political risk. However, taking the example of a firm that is state-owned or at least backed by public guarantees and whose total debts in the case of default will be covered by the state it becomes imaginable that the individual risk is lowered by public intervention. In this case the institutional design of the host country reduces the de facto risk of the project.

Assuming that $\sigma_{PR}$ enters as a multiplier as shown (2.26) and (2.27) is restrictive because it means that every partial risk of the project is affected by a change in the political environment. Although historical evidence shows that this assumption is realistic for many risks of a project, this is hardly valid for all. For example project risks due to technical characteristics or natural processes are not affected by a change in the overall political environment of the host country. If the independent partial risks that are influenced by political risk are denoted with $\sigma_i$ and those that remain unaffected with $\sigma_e$, equation can be modified and becomes:

$$\sigma_A = \sum_{e=1}^{n} \sigma_e + (\sum_{i=1}^{n} \sigma_i) \sigma_{PR}$$

It can easily be seen from (2.28) that the influence of a variation in $\sigma_{PR}$ now has less impact on the aggregate risk $\sigma_A$. Although smaller, the impact of a variation in the level of political risk is, all other things equal, still evident.
The effect of political risk on investment decision is illustrated in figure 2.22 that is analogue to the graphical solution of the DIXIT/PINDYCK-Model from paragraph 2.1.3.4.

**Figure 2.22: Effects of Political Risk in the DIXIT/PINDYCK-Model**

With $\sigma_{PR} > 1$ the F(V) line shifts to the left implying that the value of the option to invest increases. Economically this means that higher variations of future earnings imply that for the firm the value of new information and thus the value of waiting increases. Being an opportunity cost of investing today the higher option value renders fewer projects advantageous because the critical value for the profitability of the project $V^*$ goes up. Hence, with a higher level of risk the tangency point between the F(V) line and the V-I line moves to the right. With $V^*_2$ as the new critical value including political risk, investments that would be favorable if just economic risks were considered generate losses to the firm. As a consequence firms reduce investment spending which implies that with a significant level of political risk, that is a value of $\sigma_{PR} > 1$, all other things equal current FDI flows to host countries tend to decrease. It is obvious that the assumption that the aggregate risk of a given project can be precisely divided in sub-risks is not realistic. Nevertheless, this theoretical approach allows for a better understanding of how political risk affects profitability and private investment decisions.

**2.2.5.4 Empirical Evidence**

The previous paragraph presented a model studying the impact of political risk on the investment decision of MNEs. This paragraph reviews the existing empirical studies on the impact of political risk on FDI. There are various empirical methods that may be used to assess the importance of political risk in the investment decision process of MNEs. The most straightforward empirical approach is to ask decision makers in MNEs for their opinion about
the influence of political risk on their investment behavior. When surveyed about the importance of political risk managers usually rank moderate or low political risk among the most important criteria for an investment decision abroad.

Table 2.4 summarizes existing empirical studies using interviews or surveys to investigate the importance of political risk for investment decisions of MNEs. Already the pioneering studies of BASI, AHARONI, and ROOT indicate that political risk is a decisive variable for the decision of MNEs to start productive activities abroad.127

Table 2.4: Survey-Based Empirical Studies of Political Risk

<table>
<thead>
<tr>
<th>Author</th>
<th>Method</th>
<th>Sample</th>
<th>Main Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basi (1963)</td>
<td>Mail survey of international</td>
<td>International Companies</td>
<td>* A country's political risk and market potential are main determinants of FDI</td>
</tr>
<tr>
<td></td>
<td>executives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aharoni (1966)</td>
<td>In-depth interviews with</td>
<td>38 U.S. corporations that were invested or</td>
<td>* Political risk is a decisive variable for FDI decisions</td>
</tr>
<tr>
<td></td>
<td>company officials</td>
<td>planned to invest in Israel</td>
<td></td>
</tr>
<tr>
<td>Root (1968)</td>
<td>Mail-Survey of company officials</td>
<td>106 officials from UK, France, Mexico,</td>
<td>* Political risk is an important determinant of FDI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brazil and India</td>
<td></td>
</tr>
<tr>
<td>Bass/McGregorWaters (1977)</td>
<td>Survey asking executives to rate 44 variables concerning their relative importance for FDI decisions</td>
<td>175 firms contacted out of which 102 responded</td>
<td>* Host government policies and government instability are important determinants of FDI</td>
</tr>
<tr>
<td>Rolfe et al. (1993)</td>
<td>Survey of US companies asking for preferred investment incentives</td>
<td>103 US companies with operations abroad</td>
<td>* Officials ranked the absence of transfer restrictions and the existence of guarantees against expropriation as more important than tax incentives</td>
</tr>
<tr>
<td>OECD (1994)</td>
<td>Survey of company officials of</td>
<td>291 company officials from an international pool of firms</td>
<td>* Bureaucratic, legislative issues and political volatility are mentioned as investment barriers</td>
</tr>
<tr>
<td></td>
<td>investors and potential investors about motives of investment and faced barriers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tu/Schive (1995)</td>
<td>Mail survey of foreign companies in Taiwan asking for the relative importance of 18 factors for FDI decisions</td>
<td>1000 international companies contacted out of which 121 responded</td>
<td>* Political Stability, social order and governmental attitude towards FDI are important factors for FDI</td>
</tr>
<tr>
<td>Hatem (1997)</td>
<td>Combination of questionnaire and</td>
<td>311 international firms (mostly US and European) answering the questionnaire and 100 firms giving direct interviews</td>
<td>* Political and social risk are important determinants of FDI</td>
</tr>
<tr>
<td></td>
<td>interviews</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hatem (1998)</td>
<td>Combination of questionnaire and</td>
<td>311 international firms (US and European) answering the questionnaire and 100 firms giving direct interviews</td>
<td>* Political and social risk are important determinants of FDI</td>
</tr>
<tr>
<td></td>
<td>interviews</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IADB (2001)</td>
<td>Survey asking for major obstacles to business</td>
<td>At least 100 companies in each of 73 countries</td>
<td>* Policy instability is a major obstacle to business operations</td>
</tr>
</tbody>
</table>

127 See Basi (1963), Aharoni (1966) and Root (1968).
Table 2.4: Continued

<table>
<thead>
<tr>
<th>Author</th>
<th>Method</th>
<th>Sample</th>
<th>Main Findings</th>
</tr>
</thead>
</table>
| MIGA (2002)             | Global FDI-Survey   | 191 transnational corporations      | • 64% of the surveyed companies see a stable political and social environment as a very influential determinant of FDI decisions, 36% see corruption and 33% crime and safety as very influential.  
  • Between 40 and 60% see war, security of staff, transfer restriction, breach of contract, ineffective enforcement of laws and expropriations as the greatest risks for FDI. |
| Ng/Tuan (2002)          | Mail survey of foreign investors | 124 foreign companies in China       | • Stability and continuity of governmental policy are important for the investment environment  
  • The absence of capital transfer restrictions is important for the investment environment |
| McKinsey & Company (2002) | Global Survey of Investor Opinion | Worldwide survey of 200 institutional investors | • 46% of investors think that effective enforcement of property rights is very important for investment decision  
  • 32% think that efforts of the government to fight corruption are very important for investment decision |

Source: Own table

Recent survey studies confirm these findings. Rolfe et al. asked U.S. companies for a ranking of their preferred investment incentives. Among twenty incentives the absence of transfer restrictions and the existence of guarantees against expropriation turned out to be more important than tax cuts.128

OECD asked 291 company officials of potential investors and investors in transition countries about motives for and barriers to investment decisions. The main obstacles that were mentioned by managers were bureaucratic and legislative issues as well as political volatility.129 Tu/Schive surveyed the opinions of managers of foreign companies in Taiwan. Among 18 other potentially influential factors for FDI political stability and social order were consistently ranked at the top.130 The international survey of over 300 questionnaires and 100 direct interviews with international companies by Hatem offers similar results. In particular, U.S. and Japanese companies ranked political and social risks as important determinants of their investment decision.131 In a recent report the IADB published a survey asking 100

128 See Rolfe et al. (1993).
129 See OECD (1994).
companies in each of the analyzed 73 countries for major obstacles to doing business. Policy instability ranked on the third place after problems of financing and taxes. When analyzing the Latin American sample the result was even clearer as in Venezuela, Ecuador and Brazil around 70% of the surveyed business people think that policy instability is a major obstacle to business. For Colombia, Mexico and Peru around 50% hold the same view.  

Other empirical studies use historical data to explain the determinants of incoming FDI using econometric models. The empirical evidence of older econometric studies that vary largely in methodology, perspective and sample selection is mixed. Most of these econometric studies reject the hypothesis that political risk has a significant negative correlation with FDI. More recent econometric studies are reviewed in table 2.5.  

Schneider/Frey use a variable that measures past and present policies (GNP) and the investors' perception of the future policy of the country. The latter is proxied by the Institutional Investor Country Credit Rating (IICCR) which is published by the Institutional Investor Magazine. Both variables' coefficients were significant at the 99% level. Moreover, the study shows a negative correlation between the number of political strikes and riots in the host country on FDI.  

In a panel-regression of manufacturing investment of U.S. firms Wheeler/Mody find that political risk had no significant impact on investment. The index Risk they added as a proxy for political risk is based on criteria like “terrorism risk”, the “probability of opposition takeover”, the “distribution of wealth” and the “attitude towards private enterprise”. However, other crucial criteria like expropriation risk are missing.  

Harms argues that the insignificance of political risk maybe due to a sample selection bias as the sample consists of 22 high-income countries, 16 middle income countries and 4 low-income countries. This, in turn, implies that countries in which political risk is assumed to be of particular importance are clearly underrepresented. Furthermore the study focuses on the electronics industry which may be considered as “footloose” implying low irreversibility. This, in turn, reduces the influence of political risk variables as the comparatively low levels of sunk costs enable a quick withdrawal if risks are increasing.

133 For an overview of older studies see UN (1992) p.50-52 and Oseghale (1993).
134 It has to be underlined that many of these studies do not explicitly focus on the analysis of political risk but just include risk indicators as control variables.
# Table 2.5: Econometric Empirical Studies of Political Risk

<table>
<thead>
<tr>
<th>Author</th>
<th>Method</th>
<th>Sample</th>
<th>Main Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green/Cunningham (1972)</td>
<td>Cross sectional analysis</td>
<td>25 countries</td>
<td>• Political Instability does not affect FDI</td>
</tr>
</tbody>
</table>
| Schnelder/Frey (1985)   | Cross sectional analysis     | 54 developing countries     | • Investors’ perception of future policy of the country proxied by the Institutional Investor Country Credit Rating (ICCR) was significant at the 99% level.  
• Negative correlation between the number of political strikes and riots in the host country and FDI |
| Billet (1991)           | Cross sectional analysis of various years for the period 1975-1986 | 108 developing countries   | • Political Instability does affect incoming FDI  
• Political Repression does not have a positive impact on FDI |
| Wheeler/Mody (1992)     | Panel Analysis               | 41 countries                | • Political risk has little effect on FDI  
• Geopolitical risk is a significant determinant of FDI |
| Oseghale (1993)         |                               | Latin American countries   | • adverse changes in host government policy have a significant negative correlation with FDI  
• political instability and conflicts with other states had significantly negative effects in many sub-samples but did not turn out to be robust in all tested model settings |
| Woodward/Rolle (1993)   | Panel Analysis               | 187 foreign investment projects in the Caribbean | • An indicator of political stability was significant at the 10% level. |
| Jun/Singh (1996)        | Panel Analysis               | 31 countries                | • Both tested indices of political risk have a significant influence on FDI as a share of GDP  
• Average number of work days that are lost due to strikes or other events are significant for countries with low levels of incoming FDI |
| Harnis (2000)           |                               | 55 developing countries     | • A significant effect of political risk on foreign investment  
• Splitting the sample into a low income and a high income group the coefficient is higher but less significant than in the middle-income sub sample |
| Drabek/Payne (2001)     | Panel Analysis               | 52 countries                | • Higher government transparency positively affects FDI flows |
| Hausmann/Arias (2001)   | Panel Analysis               | Latin American countries   | • Country Risk has a strong and significant impact on incoming capital flows  
• Institutional quality has a strong positive and significant impact on FDI |
Table 2.5: Continued

<table>
<thead>
<tr>
<th>Author</th>
<th>Method</th>
<th>Sample</th>
<th>Main Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harm/Ursprung (2002)</td>
<td>Panel Analysis</td>
<td>62 developing and emerging market countries</td>
<td>• High levels of individual freedom attract FDI.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Sum of three sub indices of the International Country Risk Guide measuring corruption in government, the quality of the bureaucracy and a country's law and order is a significant determinant of FDI</td>
</tr>
<tr>
<td>Sun/Tong/Yun (2002)</td>
<td>Panel Analysis</td>
<td>30 Chinese provinces</td>
<td>• The risk ranking of Political Risk Services Group used as a proxy for political risk is significant on the 1% level</td>
</tr>
<tr>
<td>Stein/Dau Def (2002)</td>
<td>Panel Analysis</td>
<td>63 countries</td>
<td>• Institutional quality of nations has a strong positive and significant impact on FDI</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Lack of government commitment deters FDI</td>
</tr>
<tr>
<td>Jost/Nunnenkamp (2002)</td>
<td>Panel Analysis</td>
<td>Host countries for German FDI</td>
<td>• Country Risk has a significant impact on capital flows from Germany</td>
</tr>
</tbody>
</table>

Source: Own Table

OSEGHALE analyzes the influence of political risk on investment with time series examining U.S. FDI in Latin American Countries. A variable measuring adverse changes in host government policy has a significant negative correlation with FDI to host countries. Variables measuring political instability and conflicts with other states had significantly negative effects in many sub-samples but did not turn out to be robust in all tested model settings.¹³⁷ WOODWARD/ROLFE analyzed 187 foreign investment projects in the Caribbean Basin for the period from 1984-1987. They find an indicator of political stability to be significant at the 10% level.¹³⁸ JUN/SINGH test potential determinants of FDI divided by GDP using a panel of 31 countries for the period from 1970 to 1993. As a proxy for political risk they include the Political Risk Index (PRI) and the Operation Risk Index (ORI) of Business Environment Risk Intelligence (BERI). The PRI-index assesses the likelihood of political instability whereas the ORI-Index measures the general business environment. A panel of 105 experts evaluate a wide range of factors as the "enforceability of contracts", "nationalization" and the "attitude towards foreign investors and profits". JUN/SINGH find that both indexes have a significant influence. Furthermore, they find that the average number of work days that are lost due to strikes or other events are significant for FDI to countries with low levels of incoming FDI.¹³⁹

BISWAS uses sub-indices published in the International Country Risk Guide of the Political Risk Services Group (PRS Group). The indices reflect the risk of

¹³⁷ See Oseghale (1993).
¹³⁹ See Jun/Singh (1996).
contract repudiation by host country governments, the risk of expropriation, the quality of the bureaucracy, the degree of corruption and the rule of law. The study uses a panel of 44 countries for the period from 1983 to 1990 and finds a significant influence of the risk indices on U.S. FDI divided by GNP. In a recent econometric study on FDI to China SUN/TONG/YU find strong evidence that political risk is a significant determinant of investment. Using a panel of 30 Chinese provinces for the period 1986-1998 and introducing the risk ranking of PRS Group as a proxy for political risk they find the coefficient to be significant on the 1% level. This result turns out to be robust for several model settings and sub-periods.

HARMS uses a panel of 55 developing countries for the period from 1987 to 1995 to test for the influence of political risk on foreign investment measured as the sum of FDI and portfolio equity investment in per capita terms. Controlling for the quality of infrastructure, macroeconomic distortions, openness and the evolution of international interest rates he finds a significant effect of political risk on investment. Splitting the sample into a low income and a high income group he finds that the coefficient is higher but less significant in the middle-income sub-sample. In a later paper HARMS/URSPRUNG tested the hypothesis that international investment is attracted by political regimes that deny their citizens political rights making it easier to suppress wages. In a panel analysis of 62 developing and emerging market countries for the period from 1989 to 1997 they find the opposite. Proxying citizens' political rights with the Freedom House Index of Political Rights and Civil Liberties they find that a high level of individual freedom attracts FDI. In the same analysis they also included a variable that is the sum of three subindices of the International Country Risk Guide (ICRG) measuring corruption in government, the quality of the bureaucracy and a country's law and order tradition which turned out to be significant determinants of FDI.

This review of existing empirical studies shows that there is strong evidence for a decisive influence of political risk examining manager surveys while the results of econometric studies are less striking. These divergent empirical results indicate that the failure of many econometric studies to show a significant impact of political risk on FDI rather stem from methodological deficiencies than from the absence of a significant correlation between the two variables. There are many theoretical and methodological objections to existing econometric studies. One important theoretical objection is the choice of the variables that proxy political risks. Although the reviewed studies vary considerably in their choice of dependent variables, most of them identify

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140 Harms (2000) delivers an overview of the study.
141 See Sun/Tong/Yu (2002).
144 See Oseghale (1993).
political risk with some measure of political stability and social turmoil while other important components of political risk as for example the risk of expropriation are systematically not considered. Another theoretical drawback of these indicators of political risk is their exclusively backward-looking nature based on the implicit assumption that risk evaluations are mainly influenced by past policy events. However, if investors are rational, they should rather be concerned about the probability that policies may change unfavorable in the future. As a result most of these indicators should be weak predictors of the future investment climate.  

Moreover, even if a significant influence of aggregate political risk indicators is detected, the sources of risk are not transparent and not further explored. Given these unsatisfying results, it is impossible to derive policy implications for developing countries seeking to attract more FDI. Applying different methodologies of political risk analysis simultaneously permits a better understanding of the sources of political risks and allows to formulate strategies for the mitigation of risk. Therefore, the author considers it useful to combine econometric analysis with an in depth analysis of a country case study. Furthermore, the econometric methodology is modified to better suit the characteristics of empirical FDI models which permits to obtain more conclusive results on the impact of political risks on FDI.

2.3 Concluding Remarks
This paragraph postulates some primary hypotheses that may be drawn from Chapter 2 that are to be examined in greater detail in the following chapters. Investment models under uncertainty permit the theoretical conclusion that uncertainty reduces investment spending when investment projects are irreversible. Furthermore theoretical analysis and the review of the existing empirical evidence suggest that political risk is an influential variable for the investment decision process of MNEs. Given the fierce competition for FDI among developing nations, high national levels of political risk become a major obstacle for incoming FDI. Developing countries often lack an institutional structure that permits the creation of a stable and reliable business environment. Expropriation risks, corruption, populist policies, regulatory and judicial inefficiency as well as social unrest are all examples for factors causing investor uncertainty turning into obstacles for FDI.

Together these results indicate that shifting the focus of investment promotion policy of developing countries could imply welfare gains because investment incentives may be the wrong policy to attract FDI, as the sources of risks are not removed. Rather than granting special conditions and thus stimulating profits for investors a credible and transparent economic policy seems to be

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146 See the empirical research in Chapter 4 and 5.
more efficient to enhance FDI. A policy reducing investor uncertainty may help to attract investment more efficiently and less costly than tax exceptions or other incentives. This is in particular the case for high risk countries with low levels of political credibility that do not receive FDI due to high investor uncertainty. For these countries attracting FDI is costly as investors will not invest unless they are adequately compensated for the high risk. Even if developing countries continue granting incentives, lower levels of political risk would require lower payments for risk compensation resulting in lower "cost of capital" of external financing. Additionally, a national risk reduction strategy would imply a "double dividend" as domestic investment is likewise positively influenced by risk mitigating reforms.

In turn, policies increasing investor uncertainty should always be avoided, given their depressing impact on FDI. This becomes of particular importance when FDI flows show signs of hysteresis meaning that even if risks are objectively absent, past policies still influence the present investment behavior and path dependency implies that errors of the past still have an influence in the future. The additional fact that reputation plays an important role for the attraction of international investment makes hostile policies towards FDI an even more severe problem. Hence, reducing perceived investor uncertainty is a key element of an efficient investment promotion policy. To reduce uncertainty economic policy must be transparent and predictable which means that policy makers have to avoid policy surprises which undermine their credibility and imply future investor uncertainty. Instead, in order to implement a long term strategy for the promotion of foreign investment credible commitments not to opportunistically interfere in private property rights have to be made.

The theoretical investment models captured uncertainty with an exogenous parameter $\sigma$ the determinants of which were not further analyzed. As the preceding paragraphs indicate political risk may have diverse reasons. Warfare or expropriations could imply a complete loss of assets while other risk factors only slowly dilute property rights. The diversity of political risk factors requires a more detailed analysis of the origins of political risk that isolates the characteristics of a host country which lead to the emergence of political risk. Furthermore, it has to be investigated how these risks can be adequately measured and which societal institutions are important for the mitigation of risks. Therefore, Chapter 3 provides a detailed analysis of the determinants of political risk and their measurement.

It has already been pointed out that there are various sources of political risk that may affect foreign investors. Besides incentives, there is a great variety of measures which may be used for the mitigation of political risks which means reducing the probability of "bad surprises" for investors. To do so governments have to give credible commitment not to interfere in the activities of private investors. Even if the current institutional environment of the host country does not favor investment, it does not per se imply a risk. Surprises only occur, if the
existing institutional structure of the economy changes without any possibility for the investor to anticipate these changes. Hence, it is not only the current institutional structure which causes a risks for the investor but also the feasibility of drastic policy swings in the future. It is straightforward to see that constantly changing policy restricts the capability of economic actors to plan future investments in a reasonable way. Consequently, continuity of economic policy and transparent and foreseeable policy instruments should be the guidelines of a risk-mitigating economic policy. Also tying the hands of the government by strict rules that limit the possibilities of intervention may be a good method to reduce uncertainty for investors. Essentially, there are two ways to approach this problem. First, one may establish measures which try to reduce the perceived degree of risk through domestic reforms. One measure may be to establish more veto rights in the political process resulting in a decline of discretionary freedom for politicians. Thus, tying the hands of policy makers by binding them either by precise written laws or controlling institutions results in a higher degree of certainty for economic agents. However, changing the institutional setting of an economy is a lengthy, costly and difficult process. Furthermore, the introduction of vetoes in the political process on the one hand results in higher stability and investor credibility but on the other hand produces possible delays in decision making. Second, to avoid these problems host countries may reduce political risk by external commitments like the signing of international agreements or the membership in international organizations. In doing so governments externally tie their hands with the aim to reduce risks for private investors. These different strategies of risk mitigation are further analyzed in Chapter 3.

2.4 Chapter Summary
Paragraph 2.1 started with a definition of investment and a description of the different categories of investment. Thereafter, it reviewed the basic logic of investment theory and the most common models used in the literature. It criticizes the orthodox models for neglecting waiting options and irreversible investments. Introducing these two features into investment models permits deriving the result that uncertainty has an depressing effect on investment spending when investment are irreversible. Higher uncertainty implies further falling investment spending. Furthermore, the depressing effect is growing in the degree of irreversibility. The DIXIT/PINDYCK model used the analogy to option pricing as a microeconomic explanation for the depressing effect of higher uncertainty.

Paragraph 2.2 provided a definition of FDI and a review of common theories to explain MNE activity. Furthermore, it offers an overview of the empirical literature studying the determinants of incoming FDI. It defines political risk and shows that it negatively affects the investment spending of international investors. Moreover, a review of the existing empirical evidence highlighted the importance of political risk for FDI.

147 This approach will be further discussed in paragraph 3.1.2.5.
Paragraph 2.3 briefly summarized some possible policy implications of the theoretical models and the empirical evidence and offered some concluding remarks. Furthermore, it provides a short outline of the topics that will be analyzed in Chapter 3.