

**“Women’s labour market participation  
interacting with  
macroeconomic growth and family policies”**

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## **Overview**

The worldwide labour market participation of women of working age continues to lag behind that of men. According to the International Labour Organisation (ILO), in the beginning of the 21<sup>st</sup> century, the global share of women at working age (between 15 and 74 years) in the labour force is 54 percent, compared to over 80 percent male participation. According to the European Commission, across the 25 EU Member States in 2003, the employment rate for women was 55 percent compared to 71 percent for men. In many -not necessarily the poorest - regions of the world, women's labour market participation is actually much lower than men's. This goes especially for mothers with young children. The ILO as well as the European Commission stress that women's lower participation in the labour market exposes them to a higher risk of poverty and social exclusion. At the same time, the persisting gender employment gap is costly not only for women, but for the society as a whole. From an economic perspective, the gender employment gap represents a huge untapped source of potential talents. For this reason, one can say that the labour market loses a lot of valuable resources, the more so as women's qualifications have increased continuously during the last decades. Consequently, one might suggest that in many countries, economic growth lies below its potential and an increase of female labour market participation would provide a considerable boost to the economy.

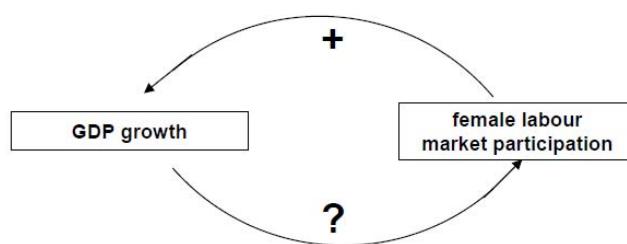
In order to prevent women from income poverty and to take advantage of women's potential for the labour market, both the ILO and the European Union have set the target to raise female labour market participation significantly within the next years. To promote gender equality in decent work, the ILO has launched a Gender Promotion Programme (GENPROM) set up within the Employment Sector to enhance activities for gender mainstreaming in employment creation. The European Union has set the Lisbon target to increase female labour force participation to 60% in 2010, which involves a marked acceleration of the trend in the number of women at work when compared to previous decades, in particular for Mediterranean countries, which lag behind by far.

The political will to promote women's labour market participation is backed up by the scientific finding that gender equality in terms of education and employment promotes macroeconomic outcomes. The finding seems intuitive, yet, it was observed only quite recently. Before 1950, in economics little attention was given to women's and men's different roles in the economy. In the 1960s and 1970s there was an increasing interest in women's economic role because women's labour market participation had continued to increase. Yet, this interest was primarily influential in microeconomics (process of intra-household decision

making, labour supply function). In macroeconomics, even today most models refer mainly to neoclassical determinants of economic development such as technology and the capital stock (along with institutions and trade) and do not have gender as an integral part of their analysis.

The present research offers a detailed investigation of the interactions between macro-determinants, gender aspects of the labour market and family policies. The first chapter discusses interactions between women's labour market participation and GDP growth. The second chapter presents an empirical analysis of the impact of GDP on women's labour market participation. The third chapter discusses the impact of family policies on mothers' employment patterns in Europe, completed by a comparative case study for Germany and France.

More precisely, in the first chapter, concerning the link between GDP (growth) and female labour market participation, both theoretical and empirical findings are taken into account. The analysis shows that, whereas economists today agree that the impact of female labour market participation on GDP is strictly positive, the reverse impact of GDP on female labour market participation is not as clear.

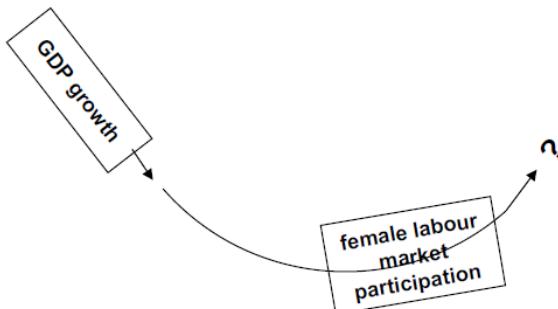


Firstly, I show how endogenous growth models suggest a positive impact of women's education and labour market participation on GDP due to their impact on a country's human capital stock. In a next step, I show how empirical studies give evidence of the fact that gender discrimination in education and employment has a negative impact on GDP, which implies that gender inequality is costly to economic development. In the next step, I find out that, whereas a series of studies, theoretical and empirical ones, clearly prove that female labour market participation promotes GDP, economists today still disagree about the inverse impact of economic growth on female labour market participation. In the literature, one often finds the common assumption that economic development promotes gender equality. Yet, there are two different theoretical approaches, one that suggests a positive impact and another that suggests that GDP growth first lowers female labour market participation at

early stages of development and then increases it in the middle and long run. I demonstrate that recent empirical studies assume a convex impact of GDP on female labour market participation: that means that at intermediate income per capita levels, female labour market participation is lower than at low as well as at high levels of income per capita. By discussing measurement and estimation problems, I point out that the present time-series and cross-country studies do not globally confirm the assumed convex impact.

The first chapter reveals a research gap in this field, which is the empirical evidence of a convex impact of GDP on female labour market participation. Answering the question of whether there is a purely positive or rather a convex impact of GDP on female labour market participation is crucial. If GDP growth can have a negative impact on women's labour market participation, simply trusting the equalising effects of economic growth is not advisable for policy makers who intend to effectively promote gender equality. If they do so, women's potential remains underutilised, and this lowers a country's growth performance.

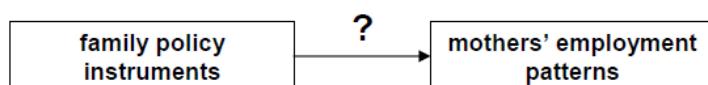
Hence, the second chapter offers an empirical analysis that attempts to close this research gap.



The mutual interactions between GDP and female labour market participation present a particular challenge to the estimation model. The two-way causality between the variable "female labour market participation" and the variable "GDP" suggests that both variables are endogenous. This endogeneity problem means that the explaining variable is correlated with the error term in the regression model. Consequently, the estimated coefficients of the "exogenous" variable are biased and inconsistent. In order to address the endogeneity problem I use a large macro panel data set (combination of cross-country and time-series data), containing observations of over 180 countries that span over four decades. In contrast to the existing cross country studies, the use of macro panel data allows taking into account methodological problems caused by endogeneity. The applied empirical methods are: fixed

effects, 2SLS, System GMM, Moving Average and Granger Causality. I pay special attention to time-specific effects and distinguish between within-country and between-country variations. Furthermore, the larger data set allows testing for the robustness of the findings by using different specifications of the endogenous variable “female labour market participation”. My empirical work confirms a convex impact of GDP on female labour market participation, although no nation in the panel went through all stages. I point out that the informative value of the estimation results depends strongly on the availability and comparability of the used data. Missing data, especially for early time periods and developing countries may bias my estimation results. Furthermore, due to insufficient data availability, the estimation model is limited to only a few exogenous variables. This limits the insight provided by the estimation because the estimation model does not filter out the impact of several important macro-level determinants that vary over time, such as institutional variables like family policy instruments.

Chapter 3 singles out this aspect. In order to investigate the impact of family policies on female labour market participation, I focus the analytical scope on a cross-country analysis based on countries of the European Union and the recent decade. I expose the impact of family policies on female labour market participation in the EU (27) by paying special attention to the impact of the presence of children on women’s time dedicated to work by distinguishing between women’s full-time equivalent employment and part-time work as well as by taking into account the division of labour within European households.



The analysis shows that mothers’ employment patterns vary widely across European countries, with 11 countries forming extremes: in Denmark, Sweden and Finland, mothers tend to continue working full-time rather than reducing to part-time at the arrival of a child. In the Netherlands, the UK, Germany and Austria, the working activity of mothers shows a strong discontinuity (interruption, part-time work). In Spain, Italy, Greece and Malta, the labour market participation of mothers appears to be quite continuous at the arrival of a child because female employment rates are rather low in general. Furthermore, the analysis suggests that the impact of children on mother’ labour market participation is influenced by family policies. The discussed family policy instruments are cash support (benefits and tax

reliefs), child-rearing allowances during parental leave and childcare support. I point out that these instruments can impact women's labour supply decision in a positive or a negative way, depending on the instruments' characteristics. In some countries, the redistributive character of several family policy instruments risks discouraging mothers' labour supply. It turns out that in Europe, one main challenge of family policy is to create a set of coherent family policy instruments that manage to simultaneously prevent families from income poverty and encourage mothers' employment. This is in particularly valid for Germany, as the case study in the second half of the third chapter shows. This case study compares French and German family policy instruments. The focus on only two countries allows a closer examination of institutional details. I conclude that, whereas in France, most family policy instruments stimulate mothers' labour supply more than in Germany, both countries' tax systems significantly discourage mothers' labour supply, and hence, reforms of the family taxation mechanisms are advisable.

## **Introduction**

Equal status among men and women is a central developmental goal of many international bodies, for example UNICEF, ILO, the UN or the World Bank. The United Nations define gender equity as related to women's rights and economic development. In its 2001 report, "Engendering Development," the World Bank formulates equal status as a goal that specifically benefits women and girls, as they bear the bulk of economic disadvantages of gender discrimination. The UN and the World Bank, however, also clearly demonstrate that inequality between men and women, particularly in terms of education, employment and income, is economically costly not just for women but also for all of society, because it limits a country's economic growth and welfare. Consequently, the United Nations Millennium Project, for example, names gender equity as one of the key elements to end world poverty by 2015.

Recent theoretical and empirical studies in economic growth support the view that gender discrimination hinders growth. Naturally, quantity and quality of institutions, the degree of integration of trade and a country's geography – particularly, its access to natural resources – have always been the key factors of income growth (cf. Rodrik, Subramanian and Trebbi, 2004). Yet, economists today agree that women's economic empowerment significantly contributes to a country's economic growth (c.F. Worldbank, 2001). Several theoretical and empirical economic studies ascertain a positive impact of women's education, employment and income on growth and thereby suggest that gender differences in education, employment and income lead to high economic costs for society. The first part of this chapter gives an overview of these studies, which prove that a reduction of gender differences in education, employment and income would accelerate a country's growth performance and therefore would raise aggregate welfare.

The second part of this chapter shows that the reverse impact of growth on the empowerment of women is much less researched and that the impact of growth on the economic status of women is not clear, neither in theory nor in terms of empirical analysis. Most available studies focus on the impact of growth on female labour market participation only. Intuitively, one would expect to find a strictly positive impact of growth on the female

labour market participation. This assumption is supported by a theoretical approach called the “modernisation neoclassical approach”, which is presented at the beginning of the second part. Yet, simply trusting the equalising effects of economic growth is not advisable for policy makers who intend to effectively promote gender equality in the labour market, because more recent studies acknowledge that the impact of growth on female labour market participation is not strictly positive. I present a series of theoretical arguments that suggest that growth convexly influences the female labour market participation, which implies a U-shaped pattern of female labour market participation along the economic development path. This means that at low income levels, income growth lowers female labour market participation relative to male labour market participation and increases it in the middle and long run only. This phenomenon is known as the “feminisation U”. Nevertheless, until today, empirical analysis gives no clear evidence, neither for the “modernisation neoclassical approach” nor for the “feminisation U” hypothesis. In the last part of the chapter, I discuss measurement and estimation problems which are the reason for the weak empirical findings. Finally, in exposing in detail what is scientifically known today concerning the interactions of macroeconomic growth and female labour market participation, this chapter discovers a research gap in the field of empirically analysing the impact of growth on female labour market participation.

## **1. Link one: The impact of women's economic empowerment on macroeconomic growth**

This section deals with a series of theoretical models and empirical studies that investigate the impact of women's economic empowerment, that is, of women's education, employment and income, on macroeconomic growth.

The first part shows how theoretical models illustrate the aforementioned growth impact. I start by elaborating how, during the evolution from exogenous to newer endogenous growth models, education (and, implicitly, accumulation of human capital) has gained increasing significance. Firstly, I present the central results of the exogenous growth model by Solow (1956). Then, I show how Barro and Sala-i-Matin (1995) endogenise a country's growth by introducing human capital as an input factor, which allows modelling continuous long-term growth. Based on Knowles, Lorgelly and Owen (2002) I investigate how gender-specific distribution of education affects a country's growth by pointing out that gender discrimination in education lowers a country's growth potential. Based on Galor and Weil (1996) I illustrate how employment and earned income of women promotes growth over generations.

The second part of this section focuses on empirical estimations of the impact of women's education, employment and income on macroeconomic growth. Firstly, I present how Barro and Sala-i-Martin (1995) estimate a negative impact of women's education on growth, followed by a critical discussion of these puzzling estimation results, which is mainly based on Dollar and Gatti (1999) and Knowles, Logelly and Owen (2002). Drawing from Klasen (2002), I show that an improvement of the estimation method yields a positive impact of women's education on a country's national income level. Then, I show how Klasen (1999) empirically proves a positive impact of women's employment on growth. Finally, I discuss Seguino's (2000) estimations of the impact of women's income on a country's income level.

## **1.1. The impact of women's empowerment on growth in theory**

### **1.1.1. Exogenous growth according to Robert Solow**

The enormous surge of economic growth in Western countries during the second half of the 20<sup>th</sup> century leads to the question as to how such growth can be secured for the long-term. Growth is usually measured as a long-term development of national income on the basis of change in per capita income. This takes the size of population into consideration. Still today, economists discuss determinants of a nation's long-term growth. This is mainly because the variables that influence long-term growth trends differ considerably from those that cause short-term economic fluctuations.

Economist Robert Solow (MIT) formulated a model of growth for closed national economies that predicts a convergence of nations' income levels. Solow's model was first published in 1956 in the *Quarterly Journal of Economics*, and Solow won the Nobel Prize for it in 1987. Solow modelled a neoclassical production function, which establishes a relationship between aggregate output and input factors:

$$Y = F(K, L) \quad (1.1)$$

with Y: national income; K: capital; L: labour

The factors of production labour,  $L$ , and capital,  $K$ , determine national income,  $Y$ . The production factors' constant returns to scale imply a doubling of output when both input factors double (hypothesis: linear homogenous Cobb Douglas production function). Output does not increase proportionally when only one input factor increases.

The declining marginal returns of  $L$  and  $K$  imply that an additional unit of input yields a larger increase in output at a low input level than at a high input level. The "Inada" constraint, typical for the Solow Model, states that the marginal returns of  $K$  and  $L$  approach infinity when  $K$  and  $L$  approach 0 and that the marginal returns approach 0 when  $K$  and  $L$  approach infinity.

The constant returns to scale allow us to write the production function with per capita terms:

$$Y = L \cdot F\left(\frac{K}{L}, 1\right) = L \cdot f(k) \quad (1.2)$$

$$= y = f(k) \quad (1.3)$$

with Y: national income; K: capital; L: labour; y: per capita income; k: per capita capital stock

Equation (1.3) shows that growth of per capita income is determined by the growth of per capita capital stock. According to Solow, capital stock growth is in turn determined by savings, population growth and depreciations.<sup>1</sup>

One of the main implications of Solow's growth model is that there exists a "Steady State" which is the long-term balance in which per capita terms no longer grow. For example, in a Steady State, the per capita capital stock's growth rate is 0. Consequently, a nation's aggregate output converges against its Steady State level. Furthermore, there is a Steady State Value  $k^*$  for each savings rate value. Another noteworthy result of the model is the dynamic impact of the "Golden Rule" of the accumulation of capital: There exists a "golden" savings rate which maximises per capita consumption in the Steady State. When the savings rate lies under or above this value  $s^*$ , the Steady State declines. Savings rates that are either too high or too low reduce per capita consumption: a savings rate that is too high directly hinders consumption possibilities and a savings rate that is too low slows down the mechanism of capital consumption indirectly with a time delay.

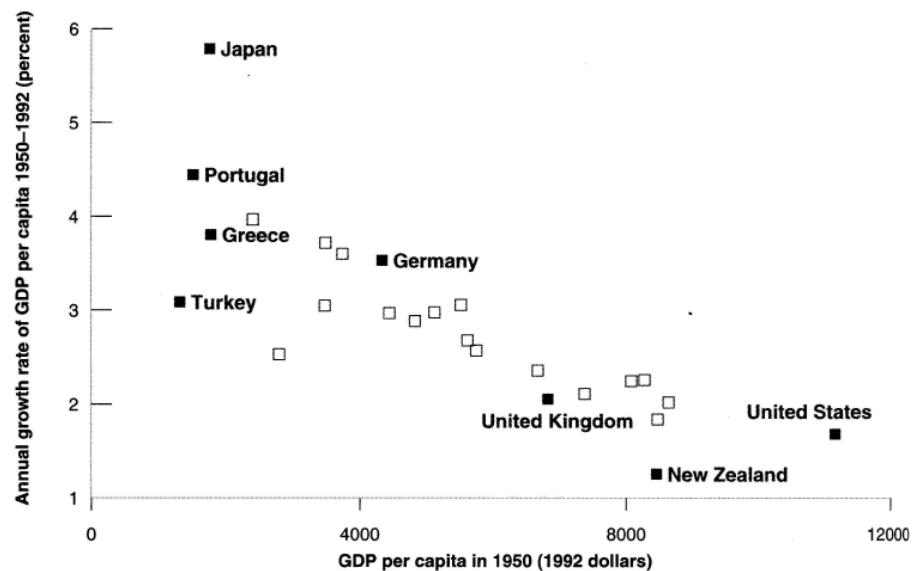
The Steady State exists due to the declining marginal returns of the input factors. Because population size  $L$  is exogenous, it is not possible for both input factors  $K$  and  $L$  to double simultaneously and an increase in  $K$  alone causes only a disproportionate increase in output  $Y$ . Hence, the Solow model of growth predicts that countries with capital stock values above the Steady State level will experience negative growth. Countries with a capital stock below the Steady State level, in contrast, will grow, although growth rates decline the closer the actual capital stock approaches its Steady State level. This is why a country's growth has an inverse relationship with initial income: Wealthy countries with high per capita capital stock (but still below the Steady State level) grow less vigorously than poor countries. As a result, the per capita income of both countries converges to a common Steady State level.

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<sup>1</sup> depreciations are amortizations of fixed capital that makes replacement investment necessary. Replacement investments keep the capital stock constant.

The graph in figure 1 shows in a comparison between OECD countries that there is an observable negative correlation between per capita income of countries during their beginning stages in 1950 and their growth rate up to 1992. Countries with low initial levels, such as Japan or Portugal, grow faster than, for example, the United States or Great Britain, which have had relatively high per capita incomes since the 1950s. The Federal Republic of Germany made up for the difference between its income and that of neighbouring countries after the Second World War and underwent a rapid accumulation of capital in the 1950s and 1960s. Blanchard (1999) underlines that, in comparison with other OECD countries, Germany's slow-down in growth during the 1970s goes back in significant parts to the Solow effect (slowing of growth after a rapid beginning growth period).

**Figure 1: GDP per capita in 1950 against GDP growth rate 1950 -1992**



Source: Blanchard (1999)

However, an examination of countries outside of the OECD reveals that Solow's growth model is not universally applicable. The model can be applied to four Asian tiger states: Singapore, Taiwan, Hong Kong and South Korea. Indonesia, Malaysia, China and Thailand also experienced strong rates of growth despite the Asian crisis of the 1990s. Still, in the poorest countries of the world, particularly in Africa, rapid growth and a convergence with the Western income level cannot be found. In Chad and Madagascar, the growth rate of per capita outputs has fallen approximately 1.3% per year since 1960 (cf. Blanchard, 1999). These examples suggest a conditional instead of an absolute convergence (cf. Barro und Sala-i-Martin, 1995): countries with similar savings rates, population growth and depreciation terms share a similar Steady-State level. Hence, a convergence of income seems only applicable to countries with homogenous parameters and similar economic structures.

Solow's exogenous growth model can not explain what influences a country's specific Steady State level. Empirical research on growth calculates that approximately 60% of a country's actual growth cannot be described by the Solow model („Solow-residual“) (cf. Blanchard, 1999).

Economists, therefore, investigate alternate growth determinants that are not included in Solow's growth theory. In a first step, an exogenous progress in technology,  $t$ , that saves capital  $K$  and labour  $L$ , was added to the model by Solow himself. A capital- and labour-saving progress in technology requires less capital and labour to maintain the same output. If production continues at the same rate, output will increase.

The new production function is:

$$Y = F(K, L, t) \quad (1.4)$$

with Y: national income; K: capital; L: labour; t: technological progress

The modelling of technological progress as a third production factor shows that the per capita growth rate in a Steady State is the same as the rate of technological progress. Yet, this model is also unable to explain the real reasons for an increase in income, because technological progress is considered exogenous. It was not until the 1980s that endogenous growth models were developed to explain long-term growth of productivity.

### **1.1.2. Endogenous growth: human capital as growth determinant**

Robert Lucas and Paul Romer primarily developed a new endogenous growth theory during the mid 1980s. They endogenise technological advancement by integrating human capital as a third input factor in the production function. This significantly improved the empirical evidence of the growth model.

Barro und Sala-i-Martin (1995) further developed this approach. They endogenise technological advancement by splitting capital between physical capital,  $K$ , and human capital,  $H$ .

The production function is:

$$Y = F(K, H) \text{ or } Y = K \cdot f\left(\frac{H}{K}\right) \quad (2.1)$$

with  $Y$ : national income;  $K$ : physical capital;  $H$ : human capital

There is an important difference between exogenous and endogenous growth models: in the aforementioned exogenous growth model, the second input factor next to capital,  $K$ , is labour,  $L$ , which is determined by population size. But  $L$  is not reproducible, as Solow assumes that a country's population size does not change and cannot simply be changed. With an exogenous  $L$ , output growth can only be achieved by growing  $K$ , but the falling marginal returns of  $K$  result in a country's income convergence in the Steady State.

The key feature of the endogenous model is that both input factors,  $K$  and  $H$ , can grow simultaneously. They are both considered endogenous and, therefore, reproducible. A simultaneous increase of  $K$  and  $H$  doubles output (constant returns to scale) and makes continuous growth without income convergence in the Steady State possible.<sup>2</sup>

With perfect competition, returns in physical and human capital equal their respective marginal product:

$$\frac{\partial Y}{\partial K} = f\left(\frac{H}{K}\right) - \left(\frac{H}{K}\right) \cdot f'\left(\frac{H}{K}\right) = R_K \quad (2.2)$$

$$\frac{\partial Y}{\partial H} = f'\left(\frac{H}{K}\right) = R_H \quad (2.3)$$

As  $K$  and  $H$  are substitutable, in the equilibrium the net earnings for both kinds of capital are:

$$R_K - \delta_K = R_H - \delta_H = r \quad (2.4)$$

with  $r$  as interest rate (market price of capital) and  $\delta_i$  as depreciation rate of  $K$  and  $H$  respectively.

Equation (2.4.) determines a single, constant relationship  $H/K$ .

If  $A = f\left(\frac{H}{K}\right)$  with  $A$  as a constant, equation (2.1.) implies:

$$Y = AK \quad (2.5)$$

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<sup>2</sup> Furthermore, it seems plausible for  $H$  to assume constant marginal returns or even increasing marginal returns due to learning by doing, spill over-effects of a worker or company on others etc. (c.f. Arrow, 1962; Phelps, 1966; Romer, 1986; Lucas, 1988).

In this simplified model,  $H$  is not produced independent of  $K$  by education, for example. Rather, it is assumed that capital investment implicitly raises human capital (cf. Romer, 1986).

Hence, a change in either  $A$  or  $K$  directly affects  $Y$ . This means that, when population size remains constant,  $Y$  will grow constantly at the growth rates of  $K$  and  $H$ .

A more detailed, modified  $AK$ -model by Barro and Sala-i-Martin (1995) obtains the same result. The economists take a Cobb-Douglas production function with the input factors  $A$  (technological level of a country),  $K$  and  $H$  and combine it with optimising behaviour of households and companies:

$$Y = AK^\alpha H^{1-\alpha} \quad (2.6)$$

This function also yields diminishing returns when  $K$  or  $H$  is increased separately, and it yields constant returns when  $K$  and  $H$  increase at the same time.

The rate of depreciation  $\delta$  is assumed to be identical for  $K$  and  $H$ .

Output can be spent on consumption  $C$  and on investment in  $K$  and  $H$  ( $I_K$  and  $I_H$ ).

Hence, the budget constraint for the national economy is:

$$Y = AK^\alpha H^{1-\alpha} = C + I_K + I_H \quad (2.7)$$

Change in both capital stocks is given by:

$$\overset{\circ}{K} = I_K - \delta K \quad (2.8)$$

$$\overset{\circ}{H} = I_H - \delta H \quad (2.9)$$

Drawing from the Ramsey growth model of 1928, Barro and Sala-i-Martin (1995) now integrate the optimisation process of households into the model. The households chose consumption  $C$  and savings  $S$  so that their utility is maximised under the intertemporal budget constraint. This raises the problem of dynamic optimisation within time: a utility function should be maximised subject to constraints, but these constraints are dynamic, since they describe economic development over time (changes in  $K$  and  $H$ ).

Therefore, the current utility function,  $u$ , which depends on the level of consumption,  $C$ , is discounted with the following time-preference factor:

$$e^{-\rho t} \quad (2.10)$$

with time preference rate  $\rho > 0$ .

The present value of the benefits is smaller the later the benefits occur.

The function that is to be maximised in a dynamic intertemporal case is called “Hamilton” function (analogous to the “Lagrange” function in the static case).

It reads:

$$\begin{aligned} J = & u(C) \cdot e^{-\rho t} + \nu \cdot (I_k - \delta K) + \mu \cdot (I_H - \delta H) \\ & + \omega(AK^\alpha H^{1-\alpha} - C - I_K - I_H) \end{aligned} \quad (2.11)$$

$\omega$ ,  $\nu$  and  $\mu$  are dynamic Lagrange multipliers.

$\nu$  and  $\mu$  represent the actual shadow price (opportunity costs) of  $K$  and  $H$  and describe a change in the Hamilton function’s value due to a change in the capital stock (one unit). This is the value resulting from an increase in  $K$  or  $H$ , occurring at time  $t$  and expressed in utility units at time 0. The Hamilton function captures the overall effect of the level of consumption on utility. This is because the function takes into account that  $C$  directly affects  $u(C)$  and indirectly affects  $\nu$ , as the level of consumption influences the changes in  $K$  and  $H$ .

The utility function is specified as follows:

$$u(C) = \frac{(C^{1-\theta} - 1)}{(1-\theta)} \quad (2.12)$$

With  $0 < \theta < 1$  as the constant elasticity of the marginal utility. The elasticity of the substitution for this utility function is the constant  $1/\theta$ . The utility function, therefore, has the property of CIES (constant intertemporal elasticity of substitution). The larger  $\theta$  is, the more the marginal utility will fall when  $C$  increases: households prefer today’s consumption over that of tomorrow.

The first derivatives of the Hamilton function  $J$  with respect to  $C$ ,  $I_K$  and  $I_H$  will now be set equal to 0 to derive the optimality conditions.

$\overset{\circ}{v}$ , and  $\overset{\circ}{\mu}$  will be equated with the net marginal products of capital  $\frac{\partial J}{\partial K}$  and  $\frac{\partial J}{\partial H}$ .

These first order conditions define the household behaviour in the optimum (consumption path), just like they do in the case of static optimisation. When inserting the results in the budget constraint and performing some simplifications, one obtains the following growth rate of consumption:

$$\gamma_c = \left( \frac{1}{\theta} \right) \cdot \left[ A\alpha \cdot \left( \frac{K}{H} \right)^{-(1-\alpha)} - \delta_K - \rho \right] \quad (2.13)$$

with  $A\alpha \cdot \left( \frac{K}{H} \right)^{-(1-\alpha)} - \delta_K$  as net marginal product of  $K$ .

The difference between the net marginal product of  $K$  and  $\rho$  determines whether households choose a bundle of consumption that increases, stays constant or decreases over time. The greater  $\rho$  is in relation to the net marginal product, the greater is the current consumption, the less is invested, and the lower is the growth of future consumption. A large elasticity of marginal utility  $\theta$  also limits consumption growth.

The second first order condition of the Hamilton function reveals that the net marginal product of human capital equals the net marginal product of physical capital:

$$A\alpha \cdot \left( \frac{K}{H} \right)^{-(1-\alpha)} - \delta = A \cdot (1-\alpha) \cdot \left( \frac{K}{H} \right)^\alpha - \delta \quad (2.14)$$

This implies that the relationship between both capital stocks can be represented as:

$$\frac{K}{H} = \frac{\alpha}{1-\alpha} \quad (2.15)$$

This yields an identical net rate of return for  $H$  and for  $K$ :  $r^*$

$$r^* = A\alpha^\alpha \cdot (1-\alpha)^{(1-\alpha)} - \delta \quad , \quad (2.16)$$

which is constant.

This implies:

The ratio  $K/H$  is constant, which means that  $K$  and  $H$  actually do grow at the same rate.

Output grows at the same rate.

Moreover, equation (2.13) implies that consumption growth also is constant and equal to:

$$\gamma^* = \left( \frac{1}{\theta} \right) \cdot [A\alpha^\alpha \cdot (1-\alpha)^{(1-\alpha)} - \delta - \rho] \quad (2.17)$$

The following applies to output:

$$Y = AK \cdot \left( \frac{1-\alpha}{\alpha} \right)^{(1-\alpha)} \quad (2.18)$$

The growth rate of  $K$  and  $H$  corresponds to the growth rate of  $Y$  and  $C$ .

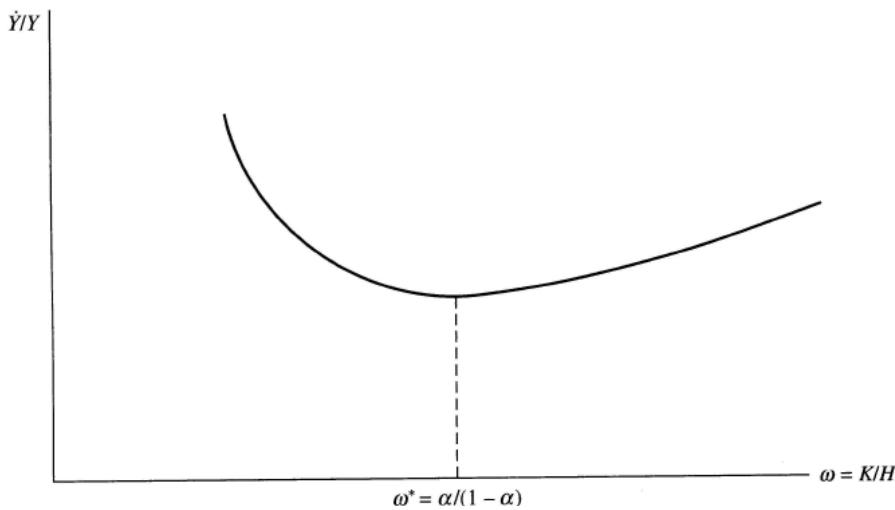
All growth rates correspond to  $\gamma^*$ .

This is how Barro and Sala-i-Martin use their endogenous growth model to prove the impact of investments in human capital on economic growth.

They also show that the restrictions  $I_K$  and  $I_H \geq 0$  lead to an important result: The growth rate of output increases the more the actual value of  $K/H$  and the Steady State value of  $K/H$  deviates. This goes for the two sorts of deviations: It has been empirically proofed that a small  $K/H$ -value (relative to the Steady State level) causes a lot of growth – for example, when a war destroys a significant amount of physical capital, but human capital remains intact. At the same time, a high  $K/H$ -value (relative to the Steady State level) also promotes growth – for example, during an epidemic, the majority of infrastructure remains intact.

However, the graph in figure 2 illustrates how growth slows down when a national economy has more physical than human capital.

**Figure 2 : Aggr. income growth in relation to the ratio physical / human capital**



Source: Barro and Sala-i-Martin (1995)

A high  $K/H$ -value implies high costs of adjustment, as the process of building human capital is costly and time consuming. The fact that a national economy can recover more quickly from a shortage of physical capital than from a shortage of human capital proves the importance of investments in research and development, in education and in advanced training for promoting long-term growth.

Yet, advances in technology offer poorer countries the opportunity to grow. The rapid growth that took place in Asian tiger states, for example, occurred despite a relatively low physical capital base, because innovations in production could be cheaply imported from abroad (imitations). However, at the same time in Asian countries human capital levels were relatively high in comparison to developing countries in sub Saharan Africa, for example. Hence, developing countries would be immensely helped if they had both easier access to already-existing knowledge and more investments in education and professional training.

### 1.1.3. The impact of women's education on growth

Knowles, Lorgelly and Owen (2002) try to answer how gender-specific dispersal of human capital influences a country's growth. They use a neoclassical model of growth that uses female and male education as separate explanatory variables to clarify the impact of gender discriminating distribution within a national economy. Their model suggests that investments in women's human capital have a positive impact on a country's productivity and growth.

The model takes into account long-term effects of education by including the output elasticity of female and male human capital as well as of physical capital. Knowles et al. (2002) also model coefficients that represent differences in education between men and women.

The aggregate production function is:

$$Y_{it} = K_{it}^\alpha EF_{it}^{\beta_f} EM_{it}^{\beta_m} X_{it}^\psi (T_{it} L_{it})^{1-\alpha-\beta_f-\beta_m-\psi} \quad (3.1)$$

$EF$  stands for education of women,  $EM$  for education of men and  $X$  for health related capital.  $T$  stands for the technology level and  $L$  for the labour force of a country  $i$  at time  $t$ .

The production factors of the Cobb-Douglas production function all have constant returns to scale and positive, declining marginal returns. It is assumed that all countries have the same elasticities:  $\alpha, \beta_f, \beta_m$  and  $\psi$ . These elasticities represent the percentage change in output associated with every 1% change in input. The elasticities lie between 0 and 1. When the elasticities add up to 1, the returns to scale are constant. In that case, the Cobb-Douglas function is linear homogeneous.

All variables are divided by  $T \cdot L$  in order to achieve a production function that contains the output quantity per effective labour force:

$$y_{it} = k_{it}^\alpha ef_{it}^{\beta_f} em_{it}^{\beta_m} x_{it}^\psi \quad (3.2)$$

Labour force and technology are assumed to increase over time:

$$L_{it} = L_{i0} e^{n_i t} \quad (3.3)$$

$$T_{it} = T_{i0} e^{gt} \quad (3.4)$$

with  $n_i$  as growth rate of a country's labour force and  $g$  as growth rate of technology, which is assumed to be uniform for all countries.

Equations (3.3) and (3.4) describe a continuous growth path with  $e$  as Euler's Number.

The growth rates of the factors of production  $k$ ,  $ef_{it}$ ,  $em_{it}$  and  $x_{it}$  are given as:

$$\overset{\circ}{k}_{it} = s_{ki}y_{it} - (n_i + g + \delta)k_{it} \quad (3.5)$$

$$\overset{\circ}{ef}_{it} = s_{efi}y_{it} - (n_i + g + \delta)ef_{it} \quad (3.6)$$

$$\overset{\circ}{em}_{it} = s_{emi}y_{it} - (n_i + g + \delta)em_{it} \quad (3.7)$$

$$\overset{\circ}{x}_{it} = s_{xi}y_{it} - (n_i + g + \delta)x_{it} \quad (3.8)$$

with  $s_{ki}, s_{efi}, s_{emi}$  and  $s_{xi}$  as shares of output (i.e. the savings rates) that are invested in  $k, ef_{it}, em_{it}$  and  $x_{it}$  (with total savings  $S$  equal to investments  $I$ ).  $\delta$  is the depreciation rate, which is the same over time and in all countries. The expression  $-gk_i$  describes the following relationship: with advances in labour-saving technology, labour efficiency units increase while the number of workers remains the same. These additional units must be endowed with capital. Net investments, measured per efficiency units of workers, are reduced by population growth. It becomes clear that  $k$  would fall according to the rates  $\delta, n$  and  $g$  if  $s = 0$ .

In the Solow model, the Steady State is defined by a constant capital stock per labour in units of efficiency. This is the case when  $sy(k^*) = (n + g + \delta)k^*$ .

With  $\alpha + \beta_f + \beta_m + \psi < 1$ , equations (3.5) - (3.8) and (3.2) imply that in the Steady State:

$$k_i^* = \left( \frac{s_{ki}^{1-\beta_f-\beta_m-\psi} s_{efi}^{\beta_f} s_{emi}^{\beta_m} s_{xi}^{\psi}}{n_i + g + \delta} \right)^{1/\eta} \quad (3.9)$$

$$ef_i^* = \left( \frac{s_{ki}^\alpha s_{efi}^{1-\alpha-\beta_m-\psi} s_{emi}^{\beta_m} s_{xi}^{\psi}}{n_i + g + \delta} \right)^{1/\eta} \quad (3.10)$$

$$em_i^* = \left( \frac{s_{ki}^\alpha s_{efi}^{\beta_f} s_{emi}^{1-\alpha-\beta_f-\psi} s_{xi}^{\psi}}{n_i + g + \delta} \right)^{1/\eta} \quad (3.11)$$

$$x_i^* = \left( \frac{s_{ki}^\alpha s_{efi}^{\beta_f} s_{emi}^{\beta_m} s_{xi}^{1-\alpha-\beta_f-\beta_m}}{n_i + g + \delta} \right)^{1/\eta} \quad (3.12)$$

with  $\tau = 1 - \alpha - \beta_f - \beta_m - \psi$ .

The Steady State values marked by \* increase with  $s$  and decrease with  $n, g$  and  $\delta$ .

Because  $k_i^*$ ,  $ef_i^*$ ,  $em_i^*$  and  $x_i^*$  are constant in the Steady State, the Steady State output per labour force  $y_i^*$  also remains constant.

By inserting equations (3.4) and (3.9) to (3.12) into equation (3.2), by logarithmising and converting, one arrives at:<sup>3</sup>

$$\begin{aligned} \ln\left(\frac{Y_{it}}{L_{it}}\right)^* &= \ln T_{i0} + gt - \frac{1-\eta}{\eta} \ln(n_i + g + \delta) + \frac{\alpha}{\eta} \ln(s_{ki}) + \frac{\beta_f}{\eta} \ln(s_{efi}) \\ &\quad + \frac{\beta_m}{\eta} \ln(s_{emi}) + \frac{\psi}{\eta} \ln(s_{xi}) \end{aligned} \quad (3.13)$$

The logarithm is used to obtain a linear relationship. Equation (3.13) represents the output per worker in the Steady State as a function of the respective savings rates of the factors of production.

When inserting the equation of the respective savings rates (that can be obtained by equations (3.10) to (3.12) in equation (3.13), one obtains a function that represents the output as a function of the Steady State sizes of the variables education and health.

$$\begin{aligned} \ln\left(\frac{Y_{it}}{L_{it}}\right)^* &= \ln T_{i0} + g - \frac{\alpha}{1-\alpha} \ln(n_i + g + \delta) + \frac{\alpha}{1-\alpha} \ln(s_{ki}) + \frac{\beta_f}{1-\alpha} \ln(ef_{it}^*) \\ &\quad + \frac{\beta_m}{1-\alpha} \ln(em_{it}^*) + \frac{\psi}{1-\alpha} \ln(x_{it}^*) \end{aligned} \quad (3.14)$$

Human capital influences growth by means of its effects on the level of output per worker in a Steady State, which, in turn, influences its growth rate. Consequently, the elasticities of changes in output level as well as in output growth are important.

By substituting the growth rate of technology  $g$  with constant  $\alpha$  and the residual  $\varepsilon_i$  one arrives at:

$$\begin{aligned} \ln\left(\frac{Y_{it}}{L_{it}}\right)^* &= \alpha + \ln T_{i0} + \frac{\alpha}{1-\alpha} (\ln(s_{ki}) - \ln(n_i + g + \delta)) + \frac{\beta_f}{1-\alpha} \ln(ef_{it}^*) \\ &\quad + \frac{\beta_m}{1-\alpha} \ln(em_{it}^*) + \frac{\psi}{1-\alpha} \ln(x_{it}^*) + \varepsilon_i \end{aligned} \quad (3.15)$$

---

<sup>3</sup> since  $Y/L = Ty$

Education coefficients are positive if  $\beta_f$ ,  $\beta_m$  and  $\alpha$  are between 0 and 1.

The following algebraic rearrangement provides a basis for interpreting the impact of gender-specific differences in education  $\ln(em_{it}^*) - \ln(ef_{it}^*)$  on a country's output:

$$\begin{aligned} \ln\left(\frac{Y_{it}}{L_{it}}\right)^* &= \alpha + \ln T_{i0} + \frac{\alpha}{1-\alpha} (\ln(s_{ki}) - \ln(n_i + g + \delta)) + \frac{\beta_f + \beta_m}{1-\alpha} \ln(ef_{it}^*) \\ &\quad + \frac{\beta_m}{1-\alpha} (\ln(em_{it}^*) - \ln(ef_{it}^*)) + \frac{\psi}{1-\alpha} \ln(x_{it}^*) + \varepsilon_i \end{aligned} \quad (3.16)$$

It becomes apparent that, when  $\beta_m$  and  $\alpha$  lie between 0 and 1, the elasticity of differences in education  $\frac{\beta_m}{1-\alpha}$  is positive.

This should be interpreted as follows: Given a fixed level of female qualification, an increase in male qualification increases the output. On the other hand, if the female educational level increases while the male level remains unchanged, the difference decreases. This shows a negative effect on account of the positive coefficient.

Yet, the interpretation of the coefficient has its limits in this model, because the coefficient simply expresses the output elasticity of male education and  $\alpha$ , and it leaves  $\beta_f$  unaccounted for.

The interpretation has also limits in the following model in which education refers to male education as well as the gender difference in education:

$$\begin{aligned} \ln\left(\frac{Y_{it}}{L_{it}}\right)^* &= \alpha + \ln T_{i0} + \frac{\alpha}{1-\alpha} (\ln(s_{ki}) - \ln(n_i + g + \delta)) + \frac{\beta_f + \beta_m}{1-\alpha} \ln(em_{it}^*) \\ &\quad - \frac{\beta_f}{1-\alpha} (\ln(em_{it}^*) - \ln(ef_{it}^*)) + \frac{\psi}{1-\alpha} \ln(x_{it}^*) + \varepsilon_i \end{aligned} \quad (3.17)$$

Whereas equation (3.16) suggests that the female level of education is the reference level for the population, equation (3.17) suggests that the population has the level of male education only. The larger the deviation between the male and the female level of education, the larger is the loss of a country's growth.

In this case, the coefficient of the difference in education  $-\frac{\beta_f}{1-\alpha}$  is negative, when  $\beta_f$  and  $\alpha$  lie between 0 and 1. The algebraic sign of the difference coefficient also depends on how other education variables are modelled. This means that, given the level of education of men and women, gender-specific differences in education have a negative impact on income. Thus, when gender-specific differences in education are large, rates of return to education are higher for women than for men due to falling marginal returns to human capital. The model of Knowles et al. (2002) shows that investment in women's human capital raises a country's human capital stock and hence output, underlining the importance of education for women and girls for a country's labour force productivity. Nevertheless, the model also shows that investments in men's education also stimulate a country's growth.

Klasen (2002) adds the following arguments in order to illustrate the findings of the discussed model: assuming that boys and girls possess evenly distributed capabilities and that children with high capabilities become better educated, it can be said that gender-specific discrimination in education reduces the potential talent pool of the labour force. If a person's human capital stock consists of capability and education, discrimination in education reduces a nation's average human capital stock, thereby also reducing the nation's potential for growth.

Yet, even though the model suggests that an increase in women's human capital promotes growth, it is important to note that the term "human capital" is not ideal to describe a person's productivity. Gardiner (2000) emphasises that even though there is some awareness that human capital is much more than formal education, difficulties in measuring other aspects such as experience, skills and social capital reduces the informative value of the term "human capital". This is especially true for women with children, since human capital refers exclusively to market-related work, while house work and home production are not considered integral parts of human capital.

#### **1.1.4. The impact of women's labour market participation on growth**

In the model discussed above, education directly affects output. However, female education also affects a nation's income in more complex ways. More precisely, it impacts women's wage expectations and therefore affects women's labour market participation decision and fertility decision. Galor and Weil (1996) investigate this chain of impacts by combining a growth model with endogenous labour supply (related to endogenous fertility) of women and

men with a household model that models the choice between unpaid household activities and paid labour.<sup>4</sup> They show that economic growth raises relative wages of women (in comparison to wages of men), which, in turn, raises female labour market participation and lowers women's fertility. According to Galor and Weil (1996), an increase in women's labour market participation and a decline in fertility raise aggregate production and consequently a country's economic growth.

The following will show that an increase in capital per worker raises relative wages for women, because capital is more complimentary with respect to female labour input as it is to overall male labour input. Furthermore, an increase in wages decreases fertility by increasing women's opportunity costs of staying at home to raise children. Galor and Weil (1996) demonstrate that the fewer women actively participate in the labour market, the lower will be the country's Steady State equilibrium. Due to the multiplicity of equilibria, an increase in women joining the labour force can be associated with an acceleration in the rate of growth.

The production function is modelled with three input factors: physical capital  $K_t^P$ , physical labour  $L_t^P$ , which, simply put, can only be performed by men due to their physical strength required for such labour, and intellectual (mental) labour  $L_t^M$ , of which women and men are equally capable. All factors have either decreasing or constant marginal returns.

It is assumed now that an increase in capital raises income from intellectual labour by the same amount, while income from physical labour remains unchanged. The more developed a country is, the higher are the wages of intellectual labour compared to wages of physical labour  $b$ . Capital is invested in labour-saving, human-capital-intensive mechanical engineering, in management or in the service sectors. The production function reads:

$$Y_t = a \left[ \alpha K_t^P + (1 - \alpha) (L_t^M)^{\rho} \right]^{1/\rho} + b L_t^P \quad (4.1)$$

with  $a, b > 0$ ;  $0 < \alpha < 1$  and  $-\infty < \rho < 1$ .

$\rho$  is the elasticity of substitution between capital and intellectual labour and is smaller than or equal to 1. The smaller  $\rho$ , the higher is the complementarity between both factors and the higher  $L_t^M$  will increase with  $K_t^P$ .

---

<sup>4</sup> For a more detailed discussion of the micro-economic principles of "intra household decision making" see chapter 3.

It is also assumed that all men and women of working age constitute couples: each man supplies one unit  $L_t^p$  and one unit  $L_t^m$ , while women, in contrast, offer only 0 or one unit  $L_t^m$ . Hence,  $L_t^p$  is the number of couples of working age, and the production function can be written in terms of units per couples by dividing through  $L_t^p$ :

$$y_t = a[\alpha k_t^p + (1-\alpha)(m_t^p)]^{1/\rho} + b \quad (4.2)$$

with  $y_t = Y_t / L_t^p$ ;  $k_t = K_t / L_t^p$  and  $m_t = L_t^m / L_t^p$  with  $1 \leq m_t \leq 2$ .

The input factors are compensated by their marginal returns. Hence, the wage compensation of one unit of physical labour is:

$$w_t^p = b \quad (4.3)$$

and the wage compensation for one unit of intellectual labour is:

$$w_t^m = a(1-\alpha)m_t^{\rho-1} \times [\alpha k_t^p + (1-\alpha)m_t^p]^{(1-\rho)/\rho}. \quad (4.4)$$

Men's wages are  $w_t^p + w_t^m$ , while working women earn  $w_t^m$  assuming no wage discrimination. Hence, in the case of unchanged labour input ratios  $m_t$ , an increase in capital raises the return of intellectual labour  $w_t^m$  and reduces gender-specific wage differences.

The decision problem of the couple is determined by the utility of the children during the first period of their life  $t$  (labour and family period) and by the utility of the consumption level during their second period of life  $t+1$  (seniority). The more children a couple has, the more utility the couple has in  $t$ , the less the couple can save for  $t+1$  and the lower their consumption  $C_{t+1}$  in  $t+1$ .

The intertemporal utility function can for example be specified as a logarithmic form of a Cobb-Douglas function:

$$u_t = \gamma \ln(n_t) + (1-\gamma) \ln(C_{t+1}) \quad (4.5)$$

with  $n_t$  as the number of children per couple.

In the model, time is the only cost factor related to children, as time for child care can alternatively be converted into wage income in the labour market. Thus, these opportunity costs of children are proportional to market wages and consequently are higher for men than for women.

A couple's income without children is  $w_t^p + 2w_t^m$ . With  $z$  as time cost of raising children for one parent per child, opportunity costs of a child are  $z \cdot w_t^m$  for the mother and  $z \cdot (w_t^p + w_t^m)$  for the father. The opportunity costs rise with the wage level. If the time used for raising all children is less than or equal to 100% of the time available to a parent ( $z \cdot n_t \leq 1$ ), the mother is solely responsible for the raising of children. If the mother must contribute more than full-time to raising children, the father also contributes part-time to child rearing.

The budget constraint during the first period of life divides a couple's income between expenses for children and savings for the future:

$$\begin{aligned} w_t^m z n_t + s_t &\leq w_t^p + 2w_t^m && \text{if } z n_t \leq 1 \\ w_t^m + (w_t^m + w_t^p)(z n_t - 1) + s_t &\leq w_t^p + 2w_t^m && \text{if } z n_t > 1 \end{aligned} \quad (4.6)$$

Interest-bearing savings provide consumption for the second period of life:

$$c_{t+1} = s_t (1 + r_{t+1}) \quad (4.7)$$

with  $r$  as market rate of return on investment (interest rate).

Figure 3 shows how utility and budget determine how many children a couple decides to have.

The optimal allocation of time for child rearing and savings (present value of future consumption) leads to three possible types of choices on the budget line (three intersections between the budget line and the utility curves).

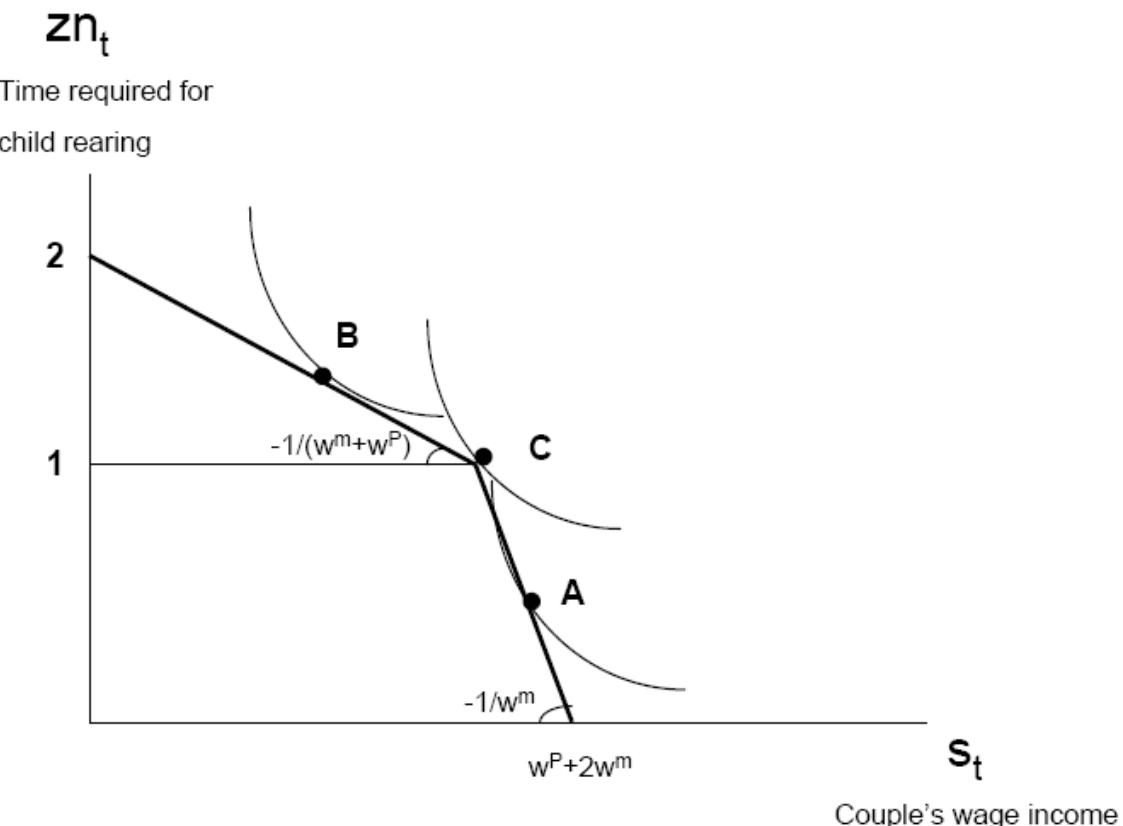
When the optimal allocation is achieved at  $z n_t < 1$ , say at point A on the budget line, this leads to the decision that the woman works part-time and the man works full-time.

At point B, the woman does not participate in the labour market and performs child rearing full-time and the man contributes to child rearing part-time.

At point C, the parents share child rearing and labour market participation equally.

Hence, the time required for raising one child,  $z$ , and the utility of a child determines the desired number of children,  $n_t$ .

**Figure 3: Division of labour**



Source: Galor and Weil (1996)

The total time allocated to child rearing results from maximising the utility function (4.5), which is subject to (4.6) and (4.7):

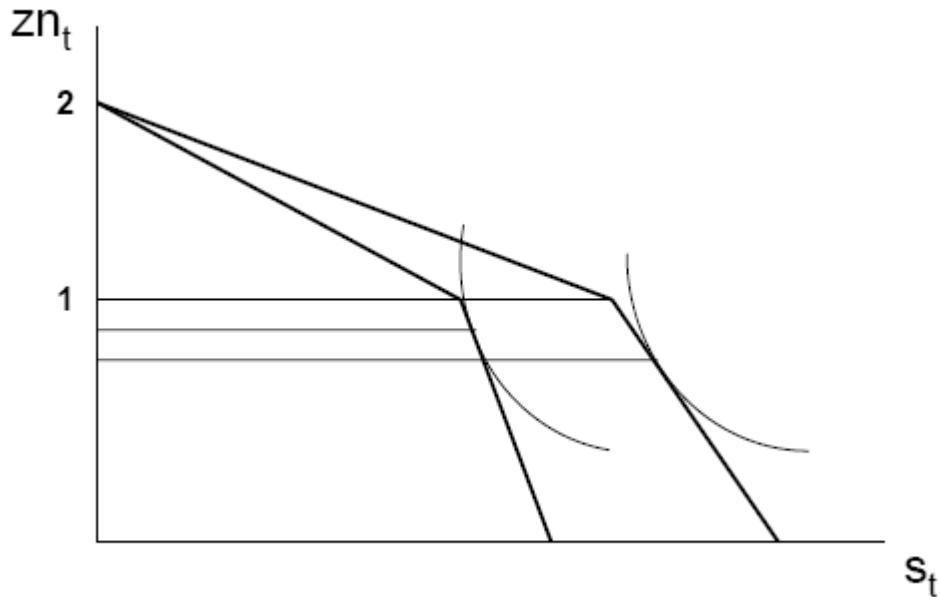
$$\begin{aligned}
 zn_t &= \gamma [2 + (w_t^p / w_t^m)] && \text{when } \gamma [2 + (w_t^p / w_t^m)] \leq 1 \\
 zn_t &= 2\gamma && \text{when } 2\gamma > 1 \\
 zn_t &= 1 && \text{otherwise}
 \end{aligned} \tag{4.8}$$

This shows that women spend  $\min(1, 2\gamma)$  of their time raising children.

Case 1 implies that a higher percentage of women enter the job market when wage  $w_t^m$  rises.

Figure 4 shows the effect of a shift of the budget line caused by a wage increase  $w_t^m$  in point B.

**Figure 4: Budget increase**



Source: Galor and Weil (1996)

A reduction in the number of children gives the woman time for wage employment. The additional income provides more savings for the second period of life.

Case 2 implies for  $\gamma > 0,5$  that women do not work independent of the wage level. However, it is empirically proved that the wage level influences a woman's decision to work. This is why the restriction  $\gamma < 0,5$  is introduced and it reads:

$$zn_t = \min\{1, \gamma[2 + (w_t^p / w_t^m)]\} \quad (4.9)$$

A couple's savings, which depends on the woman's time division between childcare and paid labour, while the man works full-time is represented by:

$$\begin{aligned} s_t &= (1 - \gamma)[w_t^p + 2w_t^m] && \text{when } zn_t \leq 1 \\ s_t &= w_t^p + w_t^m && \text{when } zn_t = 1 \end{aligned} \quad (4.10)$$

From this equation

$$m_t = \frac{L_t^m}{L_t^p} = \frac{L_t(2 - zn_t)}{L_t} = 2 - zn_t \quad (4.11)$$

and from equations (4.3), (4.4), (4.9) results for  $\gamma < 0,5$ :

$$zn_t = \min\left[1, \gamma\left|2 + b/\left(a(1 - \alpha) \times (2 - zn_t)^{\rho-1} [\alpha k_t^p + (1 - \alpha) \times (2 - zn_t)^\rho]^{(1-\rho)/\rho}\right)\right|\right] \quad (4.12)$$

Consequently, time for child rearing,  $zn_t$ , falls when capital intensity increases. Women devote their time only up to a minimal amount of capital  $k^*$  exclusively to the raising of children. Generally stated, this means:

$$\begin{aligned} zn_t &= f(k_t) && \text{for } k_t \geq k^* \\ zn_t &= 1 && \text{for } k_t \leq k^* \end{aligned} \quad (4.13)$$

A look back at equation (4.1) shows how higher labour market participation of women  $L_t^m$ , also raises output  $Y_t$ . Equation (4.2.) shows that with increased capital, a shrinking population and a less than proportionate decline of  $L_t^m$  in relation to  $L_t^p$  will raise the output per couple.

Hence, according to Galor and Weil (1996), accumulation of capital has a positive impact on women's wages and women's labour market participation and has a negative impact on fertility. Galor and Weil (1996) argue that women's higher income and lower fertility make greater savings possible. These savings raise the capital stock per worker and hence increase the income of a nation's population. This is how Galor and Weil (1996) model a positive impact of women's labour market participation on growth. Klasen and Lamanna (2003) augment this theoretical framework by the following argument: High levels of gender-specific discrimination in employment artificially restrict the nation's talent pool, because less qualified men push potentially highly qualified women out of the job market. As a result, the average available labour force within a national economy is kept artificially low (measured in

units of productivity). Furthermore, Klasen (1999) argues that, as women's income rises due to employment, so does women's bargaining power within the household, allowing mothers to invest in the education and health of their children according to their own preferences. Assuming that women spend more on their children's education than men, an increase in women's income positively affects children's physical and intellectual capacity, which later benefits the national economy in the form of raised human capital.

Today, the positive impact of women's labour market participation on growth is approved by the scientific community, but the positive impact of fertility reduction on growth assumed by Galor and Weil (1996) is partly contested. Indeed, Galor and Weil's arguments are in line with the exogenous growth model based on Solow (1956), which provides a negative impact of fertility on economic growth. Yet several endogenous growth models, for example by Romer (1986) and Lucas (1988), suggest a positive impact of fertility on growth (for more precise information about this issue, see box below).

#### **Background information: the impact of fertility on growth**

The exogenous growth model based on Solow (1956) predicts a negative impact of fertility on macroeconomic growth because, as the savings rate is assumed to be fixed, population growth lowers GDP per capita. Preliminary population growth would lead to a new equilibrium at a lower level of GDP per capita. To avoid this "dilution" of capital induced by population growth, the savings rate would have to rise, which is not possible according to the assumptions of the exogenous growth model. As with population growth, the ratio of capital to labour falls, productivity of labour and consequently wages also decrease. As labour is abundant and capital is relatively rare, the interest rate of capital increases. This phenomenon is called "capitalistic intensification".

Solow's negative impact of population growth on income per capita is in line with the arguments of Malthus (1798). Malthus sketched the picture of a "population trap" by emphasising that income growth leads to population growth, which in turn leads to an income decline. Ricardo (1815) agrees with Malthus in asserting that population growth precedes an expansion of a nation's resources, especially food resources. Thereafter, population growth, via the finiteness of natural resources, leads to pauperisation.

The predictions of the exogenous growth model present a logical problem, however: According to Solow, a continuous population decline would be extremely growth stimulating, even if the population size goes towards zero. Moreover, the model's predictions do not correspond to the observations that can be made for the 18<sup>th</sup> and 19<sup>th</sup> century in Europe, where rapid population growth went hand in hand with GDP per capita growth, especially in times of industrialisation (c.f. Blanchet, 2002). Boserup (1965, 1981) explains this phenomenon by recognising the human capacity to increase food supply: food scarcity in times of population growth, as predicted by Malthus, was the motor for new innovations in agriculture in the 19<sup>th</sup> century. New techniques, division of labour and specialisation lead to agricultural extension and intensification ("Green Revolution", c.f. also Nerlove and Raut, 1994). Hence, population growth stimulates innovations due to resource limitations. These innovations increase productivity and enable further income growth.

Boserup's arguments were developed in several endogenous growth models that integrated technological progress by considering human capital as third production factor. Arrow (1962), for example, considers technical advancement as a key element of economic growth and emphasises that innovations are driven by "learning by doing", which means that increased productivity is achieved through repeated practice and self-perfection. Phelps (1966) completes this idea by highlighting that the learning processes of each worker have positive externalities and spill over effects on other workers, which leads to economies of scale. Consequently, returns to human capital can not be considered as decreasing, but must be considered as constant individually and as increasing in aggregate (see also Romer, 1986). Lucas (1988) adopts Arrow's and Phelps' concept to explain even increasing individual returns to human capital. As technical progress is generated by the accumulation of human capital, not only education but also fertility constitutes an economic advantage: population growth increases the number of workers available to the economy and the size of manpower stimulates research efforts (c.f. Phelps, 1966). The bigger the labour force, the bigger is a nation's "talent pool" and the bigger are the spill over effects within the workforce. In addition, the higher the density of a population, the faster is the technology transfer and the knowledge exchange within a country (c.f. Lee, 1986).

However, the predictions of the endogenous growth models also present a logical problem: a continuous population increase would always be growth stimulating, even if the population size goes towards infinite. Klasen (1999) puts this proposition into perspective by emphasising that the quality aspects of the labour force should not be underestimated. Whereas Phelps (1966) points out that the quantity of the labour force induces quality by spill over effects, Klasen (1999) accentuates a possible trade-off between the quantity and the quality of the labour force. Lower fertility sets free money to invest more in the human capital of each individual, which rises individual intellectual capacity. Especially in the case of increasing individual returns to human capital, a nation's talent pool would rather profit from a rise in the individual quality instead of a rise in the quantity of its human capital stock. Thereafter, a high welfare equilibrium would result from low fertility rates combined with high individual levels of human capital, whereas a low welfare equilibrium would result from high fertility rates combined with low levels of human capital.

The theoretical arguments suppose an ambiguous impact of population growth on income. There is a series of further arguments that take into account other aspects, as for example labour market or age structure dynamics, pension schemes or even ecology. Yet, even considering several additional arguments does not reduce the ambiguity of findings. The trade-off Klasen (1999) refers to suggest that there may exist an "optimum size" of population for each country and that the impact of fertility on growth depends on a country's specific development stage. Empirical investigations do not find a clear impact of fertility on growth and what is more, they do not confirm the existence of an optimum defining equilibrium. Kelley and Schmidt (1994), for example, find a negative impact of fertility on growth in the short run for developing countries. On the other hand, Blanchet (1991) ascertains that most early empirical studies from the 1960s to the 1980s find a small but positive impact of population growth on GDP for developing countries. Recent empirical studies agree that not population growth in general, but growth of a qualified work force, which is partly driven by population growth, positively impacts a nation's macroeconomic growth (c.f. Prskawetz et al., 2006; Bloom and Canning, 2001). They underline that in this field, more empirical research is needed, especially concerning the impact of the age structure within the workforce on growth (demographic transition).

## 1.2. Empirical evidence of the impact of women's empowerment on growth

The fact that women's education and employment have a positive impact on economic growth is now generally accepted within the field of economics. Yet this positive impact suggested by theory has not always been undisputed due to contradictory and unclear empirical findings. The inconclusive early findings result mainly from the problem of reverse causality, which leads to the fact that the impact of women's education, employment and income on macroeconomic growth is not easy to investigate empirically. The double-sided

and indirect impacts of women's empowerment relative to education, employment and income on growth present several challenges to empirical estimation methods.

The first empirical studies produced unexpected results that made waves within the research community: Barro and Sala-i-Martin (1995) estimate in their growth regression that education of women has a negative impact on growth. Their methods and results are presented in a first step in the next section. Their study motivated many other economists to investigate the impact of women's education, employment and income on growth; the general consensus was that more complex data collection and estimation methods were necessary.

Dollar and Gatti (1999) and Knowles, Logelly and Owen (2002) criticise Barro and Sala-i-Martin (1995) for their inadequate consideration of collinearity and endogeneity problems. In a second step, I present their main criticism and then show how further development of estimation methods improved the significance of estimation results and proved a positive impact of women's education and employment on growth: Most notably, Klasen (1999 and 2003) made seminal advances in this line of research. I discuss the estimated impact of women's education on national income according to Klasen (2002). Then, I analyse the estimated impact of women's labour market participation on national income, according to Klasen (1999), Klasen and Lamanna (2003) and Seguino (2000).

### **1.2.1. The negative impact of women's education on growth**

Barro and Sala-i-Martin (1995) observe economic growth of several countries over time. A comparison of growth rates of per capita income (GDP) in 24 countries between the years 1965 and 1985 shows that the growth rates vary greatly from country to country. Some countries experience negative growth during the specified period, as low as -0.9% per capita (these countries include Mozambique, Nicaragua and several countries of Sub-Saharan Africa). In contrast, other countries in East Asia experience growth rates over +4.5%. Barro and Sala-i-Martin investigate a series of potential determining factors of these growth differences empirically. In contrast to hypotheses derived from the model, they estimate a negative impact of women's education on growth.

The countries' data were divided into 2 decades for the regression analysis: The first decade from 1965-1974 contains 87 countries. The second decade from 1975-1985 contains 97 countries.

The endogenous variable, the growth rate of real per capita income (GDP), is measured as the average rate for both decades (two endogenous variables: average growth rate 1965-1974, average growth rate 1975-1985). This is how the panel data set is transformed to apply a cross country regression.

The following exogenous variables are taken into consideration as growth determinants:

- The natural logarithm of GDP per capita of the base year (represented in the regression table as *log(GDP)*). The exogenous *log(GDP)* variable for the 1965-1974 growth rates as endogenous variable is the initial observation of the year 1965 of each country. The exogenous variable *log(GDP)* for the 1975-1985 growth rates as endogenous variable is the initial observation of the year 1975 of each country. This verifies Solow's convergence thesis, which states that poor countries (with a limited level of per capita income) grow faster than wealthy countries. According to Solow's growth model, it is expected that *log(GDP)* will have a negative correlation coefficient. Barro and Sala-i-Martin (1995) use the natural logarithm of GDP per capita in order to capture proportional rather than absolute differences in the distribution of GDP levels among countries.
- Human capital, measured on the basis of the proxy variables education and health. Life expectancy proxies health (*log (life expectancy)*).

Education is divided in male education and female education; The educational variables contain the number of years in primary school (years of schooling until 10 years of age), the number of years in secondary school and the number of years in higher education (*male primary education*, *female primary education*, *male secondary education*, *female secondary education*, *male higher education*, *female higher education*).

According to the theory of Knowles et al. (2002), one can expect that human capital positively impacts growth and that women's education has a larger impact on growth than men's education due to higher marginal returns).<sup>5</sup>

- The ratio of education expenditures to GDP (*G-educ/Y*) is supposed to indicate education quality, since years of schooling only reflect the quantity of education received. This ratio is expected to impact growth positively, as according to Klasen (1999), for example, the quality of the labour force is growth stimulating.
- The ratio of government expenditures to GDP (*G-cons./Y*).

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<sup>5</sup> depreciation among other factors makes it difficult to measure the level of physical capital and its evolution and definitions of physical capital vary widely across countries. Because the measured level education and health implicitly reflects a country's capital stock, the level of physical capital is not included in this regression.

This ratio is expected to impact growth negatively as it is assumed – by Abu-Ghaida and Klasen (2002) for example, that income taxation in order to finance government consumption distorts household decisions.

- The relationship between investments and GDP ( $I/Y$ ).
- The spread of the black market for foreign currencies as a proxy variable for market distortions ( $\log(1+black\text{-market premium})$ ).
- Changes in terms of trade (*growth rate terms of trade*).
- Fertility rates ( $\log(FERT)$ ).
- The countries political instability (*political instability*).

The ordinary least squares method (OLS) searches for a linear estimator that best fits the empirical values by minimising the sum of residual squares:

$$\min Q = \min \sum \hat{\varepsilon}_i^2 \quad (5.1)$$

The OLS-estimation yields a linear estimation with minimum possible variance. The OLS-estimates represent a change in the endogenous variable when a separate exogenous variable is increased, while all other exogenous variables remain constant. The estimated coefficients are not biased, consistent and efficient if the specification is correct and various assumptions of the regression model are satisfied<sup>6</sup>.

The random-effects-model is better at avoiding an omitted variable bias because unobserved exogenous variables that vary from country to country but remain constant over time are captured by an additional residual.

Another problem is that several exogenous variables, like for example those who contain information about education, risk to be correlated with one another (multicollinearity).

$$Cov(x_i, x_j) \neq 0 \quad (5.2)$$

with i, j = different variables

With multicollinearity, interpreting a regression coefficient is difficult, as the coefficient indicates how much the endogenous variable changes when one single exogenous variable is increased while all other exogenous variables stay constant hypothetically. If the

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<sup>6</sup> classical assumptions for regression analysis with OLS are for example: the error is a random variable with a mean of zero conditional on the explanatory variables; the independent variables are error-free; the predictors are linearly independent, the errors are uncorrelated, the variance of the error is constant across observations.

exogenous variables correlate with one another, it is impossible to increase one exogenous variable while keeping the other exogenous variables constant. Consequently, it is impossible to find out which determinants causes changes in the dependent variable.

Furthermore, the variables risk following a time trend (non-stationarity). A trend correction with the help of deterministic or stochastic filters brings stationary time series data, in which all influences that come from the time trend are captured by the residual. However, this can lead to autocorrelation, which means that the residuals correlate with one another.

$$Cov(\varepsilon_i, \varepsilon_j) \neq 0 \quad (5.3)$$

with i, j = different time periods

In this case, the estimates are on average not distorted and still consistent, but no longer efficient. Therefore, irregular residuals must be tested for their random character. This can be done with the help of autoregressive models (AR-models) that measure the interdependencies between the observations of a time series and adapt the OLS-estimator in a way that efficient parameters are obtained. When applying an AR-process, it is assumed that a series of observations  $y_t$  is dependent upon its own past values. An AR-coefficient shows to what extent the values of a time series depend on their past values.

Barro and Sala-i-Martin limit time series variations by dividing the measured time period into only two decades (1965-1975, 1975-1985). Table 1 in the appendix shows the first part of the regression results.

The results of the first column were estimated with the SUR-method (Seemingly Unrelated Regression) without taking into account potential correlation problems. This means that several equations could actually be estimated separately, yet they are estimated together (simultaneously). The SUR-method allows for the restriction that the coefficients of the two estimation equations representing both decades are identical. The information in the data is used efficiently by taking into account a possible correlation of the two residuals. The AR(1)<sup>7</sup>-correlation coefficient of the residuals is relatively small, at 0.21 (the coefficient measures the serial correlation of the second decade residual upon the first decade residual).

Now one must avoid that the exogenous variables are correlated with the residuals due to an endogenous relationship between growth and its determinants.

$$Cov(\varepsilon_i, x_i) \neq 0 \quad (5.4)$$

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<sup>7</sup> The number (1) indicates that the time series is generated by prior influences that lie one period in the past.

This would lead to biased and inconsistent estimators. Therefore, an instrumental variable estimation is performed. The results are shown in column 2 of Table 1 in the appendix. An instrument that controls for endogeneity must be highly correlated with the exogenous variables and not at all with the endogenous variable. Investments in education in the 1950s can, for instance, serve as instrumental variable for the education level of 1965, because these investments directly impact the later level of education, but they can not be influenced by economic growth from 1965 on. This is why Barro and Sala-i-Martin use previous period observations (lagged variables) of exogenous variables as instruments.

Now I discuss the instrumental variable (IV) regression results in the second column. The variable  $\log(GDP)$  represents per capita income of the years 1965 and 1975 (representing the first and second decade). Earlier values are used as instruments so that the income convergence rate is not overestimated.<sup>8</sup> The correlation coefficient for  $\log(GDP)$  ( $-0,026$ ) accounts for the conditional convergence hypothesis: The negative coefficient shows that poor countries grow more strongly than wealthy countries and, therefore, the income levels of countries will equal over time given the hypothetical constancy of other growth factors. This means that only countries with the same characteristics in terms of education, health, government expenditure, etc., will converge in income.

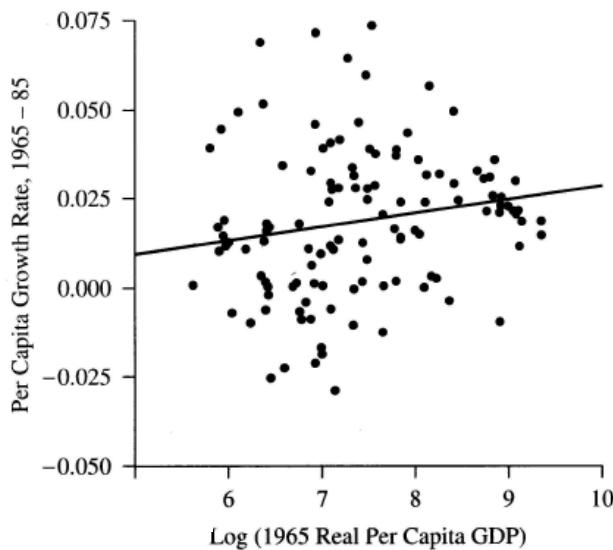
The graph in figure 5 shows a simple plot of the variables income growth and income level.

If the income level was the only variable affecting income growth, there would be a positive relationship between the two variables. Hence, wealthy countries would grow faster than poor countries, which would disprove the absolute growth convergence hypothesis. Yet, when one takes into account other growth determinants, the coefficient for  $\log(GDP)$  becomes negative. This means that, when given the same national structure, poor countries grow more strongly than wealthy countries (conditional convergence of income).

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<sup>8</sup> For example, when  $\log(GDP)$  for 1965 is measured too small, growth from 1965 to 1975 would be overestimated, since  $\log(GDP)$  of 1975 does not have the same measurement error.

**Figure 5: Per capita growth rate 1965-85 against (nat. log) real per capita GDP 1965**



Source: Barro and Sala-i-Martin (1995)

The coefficients of male secondary schooling and male higher education are 0.0164 and 0.050, respectively. The values in parenthesis are standard errors. The coefficient 0.0164 means that, with respect to the first decade, a rise in male secondary schooling by the extent of the standard deviation (0.68 years) increases the growth rate by 1.1 percentage points per year. This shows the following algebraic deduction:

$$\frac{\delta_{growth}}{\delta_{male\ secondary\ education}} * 0,68 = 0,0164 * 0,68 = 0,011152$$

Source: own calculation

The growth effect of an additional year of male higher education is larger than the growth effect of an additional year of male secondary schooling.

The coefficients of female secondary schooling and female higher education are, at -0.009 and -0.079, negative. The coefficient of female secondary schooling is insignificant and the coefficient of female higher education is only marginally significant, but a F-test of common significance shows a p-value of 0.007, according to Barro et al. (not shown in the table). Therefore, the coefficients of both female education variables are unequal to zero at a significance level of 1%.

The growth reducing effects of female education contradict the theoretical findings. Barro and Sala-i-Martin (1995) reason that this result emerges due to the high income level in wealthy countries. High gender differences in education can be seen as signs of economic underdevelopment and, therewith, as signs of high potential for income growth (convergence mechanism). Most wealthy countries with high income levels and low growth potential have smaller gender-specific differences in education. According to Barro and Sala-i-Martin (1995), this could be the reason why a growth regression (including growth rates instead of levels of GDP as endogenous variables) results in a negative impact of female human capital on growth.

The coefficient of government expenditures on education in relation to GDP ( $G\text{-}educ./Y$ ), which represents a country's quality of education, is also important to note. The coefficient is significantly positive, at 0.23. A country's quality of education, therefore, promotes growth.

In column 4, primary education of men and women were added as additional exogenous variables. The variables are neither separately nor jointly significant. This closely relates to the fact that secondary and higher education produce higher growth rates than primary school. The additional variable primary schooling does not significantly change the coefficients of secondary and higher education.

The regression results in column 8 of table 2 in the appendix contain the growth effects of fertility rates. The coefficient is significantly negative. Hence, population size negatively impacts growth, which is consistent with the theory discussed by Solow (1956). The additional variable fertility does not change the coefficients of secondary and higher education significantly.

Column 20 of table 3 in the appendix shows the regression results for an estimation including dummy variables for the regions Latin America, East Asia, and Sub-Saharan Africa. Under-average growth was measured for many Latin American and African countries, and above-average growth was measured for East Asia. It could be that growth in these countries cannot be adequately described by the exogenous variables discussed above. Consequently, omitted exogenous variables would bias the estimation results.

The dummy variable regressors are significantly negative for Latin America, negative but not significant for Sub-Saharan Africa, and positive but not significant for East Asia. This means that the previous exogenous variables describe economic growth for Sub-Saharan Africa and East Asia quite well, yet they do not adequately describe Latin America's weak growth

performance. Barro and Sala-i-Martin assume that essential aspects of Latin American politics during the 1970s and 1980s, such as corruption and a lax economic policy, are not adequately taken into account by the exogenous variables included in the regression.

Furthermore, the introduction of regional dummy variables changes several of the aforementioned regression results. What is most interesting is that the impact of female secondary schooling on growth becomes significantly positive. At the beginning of the time period measured, education was relatively uniformly distributed among women and men in Latin America compared to the other regions, and it grew little throughout the measured time period. Hence, in the regression without dummy variables, unobserved growth determinants in Latin America down biased the female education coefficients.

To conclude, the discussed regression results cannot fully describe the macroeconomic impact of women's education, employment and income. The mostly significant negative impact of female education on growth raises questions about how data was gathered and measured, which I discuss in the next section. Nevertheless, Barro and Sala-i-Martin's empirical results do present several important findings. The growth of a country is determined by a series of variables. One can observe that fast and slow growing countries differ mainly in terms of government consumption, as well as in terms of expenditures on education and investments.

Furthermore, the economists show that female education has a significantly negative impact on fertility and a significantly positive impact on health (regression results not shown here); these results strengthen the notion that women's education generates growth also indirectly by affecting fertility and health. Because indirect effects are not considered in the growth regression discussed above, one can assume that the effects of female education on growth are significantly underestimated. The empirical estimates of Klasen (2002) presented in the next but one section deal with this problem.

### **1.2.2. Methodological problems**

Barro and Sala-i-Martin (1995) describe their estimation results, which suggest a negative impact of female education on growth, as "puzzling findings." They explain the results with the effect of underdevelopment as well as with the omission of a dummy variable for Latin America. Since then, data collection and estimation methods have been analysed and further developed and a number of economists have concentrated their research on the growth

effects of female education. The advancement of empirical methods allowed for more trustworthy results, the majority of which demonstrate that gender-specific differences in education and employment hinder a country's economic growth. This section gives an overview of scientific reactions to Barro and Sala-i-Martin's regression results.

#### *Underdevelopment effect*

Dollar and Gatti (1999) do not accept Barro's reference to an underdevelopment effect, because the estimation equation already included initial per capita income as exogenous variable, which reflects a country's development stage.

#### *Mulicolinearity*

Klasen (2002) states that Barro and Sala-i-Martin's estimation does not sufficiently account for the high colinearity between female and male education. The correlation between both variables is over 90%, according to Klasen. This problem of multicollinearity makes it almost impossible to separate the impacts of female and male education on growth. The relatively large standard errors of the education coefficients also points to this problem.

#### *Endogeneity*

Furthermore, Klasen (2002) refers to an insufficiently solved endogeneity problem between growth and education. A higher human capital stock may generate growth, but inversely a country's growth may promote investments in education (cf. Galor and Weil, 1996). This inverse causality makes estimations with appropriate instrumental variables necessary. Barro and Sala-i-Martin's use of lagged variables as instruments did not perfectly solve the endogeneity problem. Dollar and Gatti (1999) recommend religion and civil rights as instruments for education; these variables may influence gender-specific distribution of education yet do not influence a country's growth directly. Dollar and Gatti (1999) note, for instance, that educational difference among men and women are prominent within Muslim and Hindu cultures, while there is less of an educational gap between men and women in predominantly Protestant regions. Moreover, Dollar and Gatti (1999) justify their consideration by emphasising that predominantly Protestant countries tend to grow faster than countries in which the Muslim and Hindu religion are dominant. However, the use of religion as proxies for education, or more general for economic development, is questionable. To rely on the statistical correlation between the two variables bears the risk of encouraging a simplistic discussion about development restraints of non-Christian countries.

### *Estimation errors and omitted variable bias*

Forbes (2000) names another central problem of measuring growth: the lack of access to data over long time periods. Countries often have very different measurement conceptions and methods for the variables economists are interested in. Data are often incomplete and inconsistent in terms of time. Estimation errors and omitted variables due to missing data reduce the estimation's significance (omitted variable bias). Systematic measurement errors lead to either positively or negatively biased estimators, which is dependent on the correlation between estimation errors and other variables in the regression. If countries tend to tone down the gender-specific difference in education that they report (that is, they report a smaller gap than actually exists) and if these countries have an under-average growth at the same time, the negative impact of gender-specific educational differences on growth will be underestimated. If variables that increase inequality between men and women and reduce growth, such as the degree of corruption for example, are omitted in the regression, the negative impact of gender-specific educational differences on growth will be overestimated. Furthermore, the omitted dummy variable for Latin America causes an omitted variable bias, too. Unobserved country-specific effects, such as production technology standards that are not represented by proxy variables, go into the residuals of the estimation equation. OLS- and Generalized Least Square<sup>9</sup>-Methods (among others, SUR) will produce consistent estimators only if country-specific residuals are not correlated with exogenous variables. Yet, in Barros and Sala-i-Martin's dynamic cross-section analysis, residuals are correlated with initial per capita GDP. This biases the estimators. Klasen (2002) recommends applying a Generalized Method of Moments (GMM) estimation method for dynamic panel data (combination of aggregated cross-country and time series data), in which the estimators eliminate growth determinants that are unobservable and/or difficult to measure and remain constant over time (country-specific effects such as climate and geography or a country's political and legal system) by using differences.

The following is a simplified mathematical representation of this method:

$$y_t = \beta_1 x_t + \beta_2 z_t + \varepsilon_t \quad (6.1)$$

with  $x$  as observable and  $z$  as an unobservable exogenous variable, that does not change over time since  $z_t = z_{t-1}$

$$= y_t - y_{t-1} = \beta_1 \cdot (x_t - x_{t-1}) + \beta_2 \cdot 0 + \varepsilon_t - \varepsilon_{t-1} \quad (6.2)$$

---

<sup>9</sup> GLS-methods are more general OLS-estimation methods that control for autocorrelation and heteroscedasticity.

Hence, the regression coefficient for  $x$  is no longer biased. The next chapter will illustrate the procedures and results of Klasen's (2002) growth regression.

### **1.2.3. The positive impact of women's education on economic growth**

Klasen's (2002) regressions are based on cross-country data as well as on panel data (combination of cross-country and time series data) and analyse whether limited schooling of women and girls reduces a country's growth. His empirical analysis proves both direct and indirect growth effects of uniformly distributed education among women and men. Educational discrimination is a direct hindrance to growth because it reduces a country's human capital stock. Moreover, education of women has both direct external effects, because children profit from their mothers' education, and indirect external effects, as it reduces population growth. Klasen explicitly models these indirect effects. A regression that, for example, models fertility only as an exogenous variable, underestimates the total growth effect of educating women.

The effects measured are robust against changes in specification. The estimation method considers endogeneity problems. About 0.4-0.9 percentage points of growth difference between fast growing countries in East Asia and slow growing countries in Sub-Saharan Africa, South Asia and the Middle East can be explained by gender-specific differences in education.

Insufficient data availability makes measures of the impact of female education on growth somewhat problematic. Women's household and child rearing activities are measured only in a few countries and overall changes in quantity and quality of this sector are generally not measured. It can therefore be assumed that growth effects from women's education are underestimated, because advances in productivity within private realms remain unaccounted for.

Klasen uses data from 109 countries that spans three decades, 1960-1992, and, therewith, measures long-term growth more effectively than did Barro and Sala-i-Martin (1995), whose estimations were based on a time period that covers only 20 years. First, Klasen does a cross-country regression based on average values of all observations for the years 1960 to 1992. He measures growth as change over time in a country's "Purchasing Power Parity" (PPP) per capita. The PPP allows for a better comparison between countries because it

accounts for different price levels between countries and, therewith, makes it possible to compare standards of living.

The endogenous variable is the average growth rate in PPP from 1960-1992 (*growth*). This variable is determined by a series of exogenous variables:

- population growth (*Popgro*)
- labour force growth (*LFG*)
- degree of openness (free trade) (*OPEN*)
- investment rate in relation to GDP (*Inv*)
- regional dummy variables
- education

Education is specified by the variables *ED60*, *RED60 GED*, and *RGED*:

- *ED60* measures the adult (age 15 and on) population's total years of schooling in the year 1960.
- *RED60* measures total years of schooling of women in relation to total years of school of men (again, age 15 on) in the year 1960. The closer the variable *RED60* of a country is to 1, the more evenly distributed education was in 1960.
- *GED* measures the averages growth in total years of schooling of the adult population between the years 1960 and 1990.
- *RGED* measures the average growth of the ratio of total years of schooling of women and total years of schooling of men between 1960 and 1990.

The following equation estimates the direct impact of the aforementioned determinants on a country's growth rate:

$$g = \alpha_1 + \beta_1 Inv + \beta_2 Popgro + \beta_3 LFG + \beta_4 ED60 + \beta_5 GED + \beta_6 RED60 \\ + \beta_7 RGED + \beta_8 X + \epsilon \quad (7.1)$$

Equations (2) to (4) estimate the impact of education on investments, population growth and labour force growth:

$$Inv = \alpha_2 + \beta_9 Popgro + \beta_{10} LFG + \beta_{11} ED60 + \beta_{12} GED + \beta_{13} RED60 + \beta_{14} RGED + \beta_{15} X + \varphi \quad (7.2)$$

$$Popgro = \alpha_3 + \beta_{16} ED60 + \beta_{17} GED + \beta_{18} RED60 + \beta_{19} RGED + \beta_{20} X + \varphi \quad (7.3)$$

$$LFG = \alpha_4 + \beta_{21} ED60 + \beta_{22} GED + \beta_{23} RED60 + \beta_{24} RGED + \beta_{25} X + \gamma \quad (7.4)$$

A path analysis shows the overall growth effect of education, which indirectly impacts growth via investments, population growth and labour force growth. Hence, the overall growth effects of total years of school of women in relation to total years of school of men in 1960 (*RED60*) is:

$$\beta_6 + (\beta_{13} * \beta_1) + (\beta_{18} * \beta_2) + (\beta_{18} * \beta_9 * \beta_1) + (\beta_{23} * \beta_3) + (\beta_{23} * \beta_{10} * \beta_1) \quad (7.5.)$$

The first term describes the direct growth effect, the second term the indirect growth effect via investments, the third term the indirect growth effect via population growth, the fourth term the indirect growth effect via population growth and investments, the fifth term the indirect growth effect via labour force growth, and the sixth term measures the indirect growth effect via labour force growth and investments.

Equation (7.6) measures only the growth effects of education and omits other growth determinants (reduced form which contains the risk of obtaining biased estimation results due to missing determinants):

$$g = \alpha_5 + \beta_{26} ED60 + \beta_{27} GED + \beta_{28} RED60 + \beta_{29} RGED + \beta_{30} X + \nu \quad (7.6)$$

The somewhat complex modelling of education with four variables helps avoiding multicollinearity problems. *ED60* and *GED* represent a country's overall human capital stock; *RED60* and *RGED* describe gender-specific differences in education. The correlation coefficients between Klasen's education variables, that means between *ED60* and *RED60* as well as between *GED* and *RGED*, are smaller than the correlation coefficients between the education variables specified by Barro and Sala-i-Martin (1995). The smaller correlation makes it easier to identify different effects. One is able to measure if a country with a small gender-specific difference in education grows faster than a country with larger gender-specific educational disparities, given the same human capital stock in both countries.

The estimations of proxy variables for *ED60* and *GED* are based on two different assumptions:

- 1) If one assumes that a reduction in educational differences is possible when the level of education for men remains constant, the number of school years of men can be used as a proxy for measuring the average total years of schooling of a population in 1960 and its increase (*ED60* and *GED*).
- 2) If one assumes that investments in women's education partly reduce investments in men's education, an estimation with the aforementioned proxy overestimates the real growth effect of a reduction in gender-specific educational differences. If one assumes that investments in the education of women reduce investments in the education of men in equal shares, the number of average school years of men and women can be used as a proxy of average years of schooling of an adult population in 1960 and its increase (*ED60* and *GED*). This procedure would underestimate the real growth effect of a reduction of gender-specific differences in education.

It is difficult to say which of the two assumptions corresponds better to reality. Klasen (2002) states that for developing countries, it is probable that investments in women's education partly and initially reduce investments in men's education as long as these countries still face important resource constraints. On the other hand, Goldin (1994) states for the USA, for example, that the enormous investments in female education in the 1920s and 1930s have led to a catching up of female education levels without reducing male education levels.

A further problem is endogeneity, as here again it is possible that a country's growth influences investment in education (inverse causality), which would bias the estimation results. A remedy would be to perform an estimate using instrument variables. Klasen (2002) tries to solve this problem by using lagged variables as instruments in a way that is similar to Barro and Sala-i-Martin's (1995) approach, yet Klasen carries out a more complex, three-step procedure.

Firstly, the educational level of the population (25 years old and over) in the year 1970 is entered into the regression. This variable is not influenced by economic growth after 1960, because the primary educational level of a 25-year-old in 1970 would have been impacted by investments in education that occurred between 1940 and 1955.

In the second step, expenditures on education, fertility rates of 1960 as well as changes in the fertility rate are introduced into the regression as instruments for changes in school years *GED* and changes in gender-specific school years *RGED*.

In the third step, the model is estimated with a panel data set in which the variables are divided into 3 decades (1960-1970, 1971-1980 and 1981-1990). The education variables of 1960 (*ED60* and *RED60*) are the only exogenous variables used in this regression.

The first column of table 4 in the appendix shows regression results from the first estimation equation. The significantly positive coefficients of the investment rate (*Inv*) and the degree of openness (*open*) confirm their growth promoting impact. Population growth has a significantly negative impact and labour force growth has a significantly positive impact on growth. Regional dummy variables for Sub-Saharan Africa and Latin America are significant.<sup>10</sup>

Total school years of the adult population in the year 1960 (*ED60*) as well as the average increase in school years of the adult population between 1960 and 1990 (*GED*) have a significantly positive impact on growth.

The most relevant coefficients are those of the total school years of women compared to men in 1960 (*RED60*) as well as of the average increase in the ratio between total school years of women and men between the years 1960 and 1990 (*RGED*). Both coefficients are significantly positive. An increase in *RGED*, from 0.5 to 1.0 (in other words, the number of school years of women doubles and becomes identical to the number of school years of men), would raise the annual growth rate about 0.4 percentage points.

This shows the following calculation:

$$[\beta_7 + (\beta_{14} * \beta_1) + (\beta_{19} * \beta_2) + (\beta_{19} * \beta_9 * \beta_1) + (\beta_{24} * \beta_3) + (\beta_{24} * \beta_{10} * \beta_1)] \times 0,5 = \\ [0,69 + (1,28 * 0,056) + ((-0,22) * (-0,55)) + ((-0,22) * (-0,81) * 0,056) \\ + ((-0,13) * 0,62) + ((-0,13) * 2,6 * 0,056)] \times 0,5 = 0,3965656$$

Source: own calculation

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<sup>10</sup> Significance shown in table: values in brackets are t-values; \* significance at 90%-level, \*\*\* significance at 95%-level; \*\*\* significance at 99%-level.

Column (2) of table 4 in the appendix shows the investment coefficients from equation (2). Investments are significantly positive correlated with labour force growth and openness. The higher *ED60* and *RED60*, the higher is a country's investments. This also applies to *GED* and *RGED*, though these coefficients are not significant. Nevertheless, the positive coefficients confirm the indirect impact of education and its distribution on growth via investments.

Column (3) and (4) show regression results for population growth and labour force growth, based on equations (3) and (4). The results show that a reduction in gender-specific differences in education time (an increase of *RGED*) reduces population growth and labour force growth over time.

Column (5) shows the regression results of the reduced form (equation (5)). The coefficients in the fifth column are significantly higher in value than the results presented in the first column. This confirms that education has large indirect impacts on a country's growth – above all, in terms of its impact via investments.

The sixth and seventh regression estimate equation (1) and (5) by using average human capital of women and men instead of only human capital of men as a proxy for education. The coefficients remain significant, but are as foreseen somewhat smaller than those in the first and fifth column. This proves that the estimation results are robust against changes in specifications.

Klasen's calculations, shown in table 5 in the appendix, show what share (in percent) in growth differences between countries with strong growth (East Asian and pacific regions) and countries with little growth (Sub-Saharan Africa, South Asia, the Middle East and North Africa) can be explained by unequal distribution of education (*RED60* and *RGED*). The first 3 columns show results for the specification in which education of men is used as a proxy for average human capital (overestimation). The last 3 columns show results for the specification in which education of both men and women is applied as a proxy for human capital (underestimation).

The coefficients in the first column indicate the following: growth in Sub-Saharan African and East Asian/Pacific countries over the years 1960-1992 differs by 3.3 percentage points. 0.45 of the total percentage points comes from educational differences between women and men, of which 0.08 points represent educational differences in 1960 (*RED60*) and 0.37 points represent educational differences throughout the years after 1960 (*RGED*). The indirect

effects of educational differences are very small; for instance, only 0.07 percentage points of the difference in growth comes from investment channels.

When direct and indirect effects are added together, the resulting coefficient is 0.56. Overall, 0.43 percentage points of the difference in growth between Sub-Saharan African and East Asian/Pacific countries come of *RGED* and 0.13 percentage points come from *RED60*. Concerning the growth difference between South Asia and East Asia/Pacific, between 0.95 and 0.77 percentages come from unequally distributed education. Concerning the growth difference between the Middle East/North Africa and South Asia/Pacific, between 0.86 and 0.69 percentage points are caused by educational discrimination. This shows that impact of an uneven distribution of education on the growth difference between regions is massive, as it accounts for approximately one fourth of the difference in percentage points.

Klasen (2002) estimates equations (1) and (5) using a panel data set covering 3 decades to control for possible endogeneity. He also conducts a two-step OLS regression; the instruments are government expenditures for education (relative to GDP), the fertility rate in 1960 as well as the change in fertility rates from 1960-1990. These factors directly affect education and only indirectly affect economic growth. Both estimations do not change the size and the significance of the education coefficients essentially (results not shown here). This shows that education and its distribution have a significant impact on a country's economic growth and overweight the reverse effect – that is, the impact of growth on education.

Lastly, Klasen controls for country-specific effects. He divides the countries into homogenous groups and repeats the estimations for each group separately. The coefficients do not undergo any significant change.

To conclude, Klasen's empirical analysis confirms that education and its equal distribution among men and women have a significant positive impact on growth. In Sub-Saharan African countries, which experience the smallest average growth in per capita income per year (0.9% per year, which is only 40% of the world average), the average woman in 1960 received 1.09 years of schooling. The number of years has increased at an under average pace through to 1992. Booming regions like in East Asia/Pacific experienced similarly low education rates of women and girls in the 1960s, but investments in female education has since surpassed that of men by 44%. This speaks for a positive impact of investments in female education on economic growth.

The estimation results are robust against different specifications. Problems of multicollinearity and endogeneity are taken adequately into account. According to Klasen, an equal distribution of education always yields a win-win situation for a country: economic growth and other essential developmental goals, such as reduction of child mortality, go hand in hand.

#### **1.2.4. The impact of women's labour market participation on growth**

The impact of women's labour market participation and income on growth has been studied empirically much less than the impact of women's education on growth, and the relevant studies have all been conducted in the past 10 years. Studies on the growth effect of female labour market participation have been done primarily by Klasen, and studies on the growth effect of female wage have been done primarily by Seguino. Klasen (1999) estimates a positive growth effect of an increase in women's labour market participation which is presented in this section. Seguino (2000) estimates a (conditional) positive growth effect of wage differences between women and men. This means that a country's growth is greater the less women earn in relation to their male colleagues. The conditions for this conclusion are described in detail in the following section.

According to Klasen (1999), an increase in female labour market participation generates growth, because an less than proportional employment of women in formal labour sectors distorts the selection of productive workers. The average ability of a country's labour force is artificially reduced. This hinders a country's ability to be internationally competitive. Furthermore, Klasen draws from Galor and Weil (1996), that women's employment and earned income promote growth by increased savings. Moreover, a less than proportional employment of women reduces growth due to a measurement effect: household and child rearing activities are usually not captured by economic measures. Substituting these activities with employment, which is recorded as data, raises a country's measured economic output.

For the regression, Klasen uses the same data set that he uses as discussed in the previous chapter (109 countries, time period 1960-1992). The data set shows that women in Africa, South Asia and the Middle East are under-represented in the labour force over the whole time period. The percentage of women in the official labour force in Africa, for example, increased from 1970 to 1990 by only 1.6%.

The exogenous variable, which is the change in the purchasing power parity per capita, is explained by the following endogenous variables:

- the natural logarithm of the initial income level of the year 1960 (*LNINC60*)
- the degree of openness (*Open*)
- the four known education variables (*ED60*, *RED60*, *RED60* und *RGED*)
- growth in the female labour market participation

Growth in the female labour market participation is specified by the variables *GEMPF* and *CHFSL*:

- *GEMPF*: growth in the share of women working in the formal labour sector in the number of all women of working age. Data for this variable is only available for 66 countries, as many countries do not record data about women who do not work.
- *CHFSL*: change in the share of women working in the formal labour sector in the country's entire labour force (women and men who work). Because for this variable, observations of the working population only are necessary, data are available for all 109 countries.

The estimation results are shown in table 6 in the appendix. Column (6) shows a significantly positive coefficient for *GEMPF* of 0.8. The coefficient for *CHFSL* (Column 7) is positive, but not significant.

Because of the incomplete data base, it is impossible to find an appropriate instrument to control for possible endogeneity. Consequently, the estimation results have to be interpreted with care. They do suggest a positive selection and measurement effect that overestimate the impact of female labour market participation on a country's measured growth.

Klasen (1999) calculates that low female labour market participation contributes to about 0.3 percentage points to the difference in growth performance between strongly growing countries in East Asia and slowly growing countries in South Asia, Sub-Saharan Africa and the Middle East.

Klasen and Lamanna (2003) do the same regressions based on a larger data set containing a longer time period (1960 to 2000). They conclude that while gender-specific differences in education are essentially reduced in the Middle East and North Africa, the gender-specific differences in employment are barely reduced.

### **1.2.5. The impact of women's income on economic growth**

Seguino (2000) analyses growth determinants for half-industrial, export-oriented countries. She concludes that a limited relative wage for women, who make up a large percentage of the labour force within the export sector, stimulates growth. The empirical analysis shows that there is a positive correlation between unequal pay among women and men and a country's GDP growth.

Seguino (2000) explains this phenomenon with the following arguments: Half-industrial export-oriented countries export finished goods and import intermediate and capital goods as well as technical licenses from industrial nations. These countries' specialisation in specific manufacturing sectors – for example, East Asia's specialisation in textile production – allows for economies of scale and, therewith, competitive prices. In almost every country, there are concentrations of women within certain employment sectors (job segregation), such as in the field of fine handwork. Today in half-industrialised countries, the majority of workers in the export industry tend to be female. International competition causes the export sector to exert wage pressure on employees. The bargaining power of workers is limited, and women within this sector are paid little for their productivity. The resulting cost savings represent a Ricardian comparative cost advantage for half-industrialised countries. While finished products are exported, new technologies that improve production processes are imported (spill over effect). Employees must adapt to new technologies quickly. This is why low wages can not be the only generator of growth; it is also important that women are well trained and highly productive at the same time. Consequently, only a real discrimination in wage promotes growth in these countries – that is, when women with the same qualifications as men earn less than men. The less increases in education are reflected in women's wages, the more the country benefits from wage discrimination with respect to growth.

Seguino uses data from 20 half-industrialised export-oriented countries that spans the years 1975-1995. The majority of these countries are in East Asia (for example, Taiwan, Singapore, Korea, Hong Kong, Thailand and Malaysia). Export-dominated branches include textiles, electronic, shoe, plastic and rubber manufacturers. Seguino's use of average periods eliminates time series effects.

The determinants of growth in the regression are:

- the change in capital stock  $d/\log K$
- the level of human capital  $HK$  as the share of people aged 15 and over who have obtained secondary schooling
- the wage gap between men and women

The wage gap between men and women is specified by the variables  $WGAP1$ ,  $WGAP2$  and  $WGAP3$ :

- $WGAP1$  stands for absolute differences in wage between women and men
- $WGAP2$  stands for differences in wage relativised by differences in education among men and women (pure wage discrimination)
- $WGAP3$  stands for the interaction between  $WGAP2$  and average schooling in order to control for the assumption that growth in exports based on large difference in gender-specific wages is only possible when the human capital stock is high.

The regression results are shown in table 7 in the appendix. The coefficient of  $WGAP1$  is significantly positive. An increase in wage differences of 0.1 percentage points raises a country's growth by 0.15 percentage points. The coefficients of the relativised wage differences  $WGAP2$  and  $WGAP3$  are also significantly positive. An increase in wage differences according to the definitions  $WGAP2$  and  $WGAP3$  of 0.1 percentage points increases a country's growth by 0.1 percentage points. The positive coefficient of  $WGAP3$  confirms that wage discrimination and education of women form a complementary relationship.

Seguino (2000) repeats the regressions based on 5 year averages instead of period averages to control for country and time specific effects. All the three wage difference coefficients remain significantly positive.

The empirical analysis shows that – under the condition that education is equally distributed– wage differences between women and men promote a country's export level and thereby, increase output. However, it is important to note that the empirical analysis is based on export-oriented, semi-industrialised countries in East-Asia only and therefore, the result should not be considered to be universal. There are several arguments that suggest a positive impact of women's income on growth. Galor and Weil (1996) emphasise that an

increase in women's income can be growth promoting due to higher savings. Klasen (1999) argues that women's income promotes growth because it allows mothers to invest in the education and health of their children. These arguments suggest that further empirical research is needed concerning the impact of women's income on growth.

It is important to note that Seguino (2000) does not include women's labour market participation as exogenous variable in the regression. High labour market participation of women means that there are also less productive women participating in the labour force. This lowers both average productivity and average wages of women. It can be assumed, that including women's labour market participation in the estimation would reduce the growth effect of gender-specific wage discrimination.

Seguino (2005) underlines that in East Asia, women's wage discrimination contributes significantly to the countries' boom in economy while women do not personally benefit from the fruits of their work. According to Seguino, economic integration and liberalisation of international markets can have negative consequences for women's wages and working conditions. Economic growth spurts in East Asia have not improved the situation for working women. In 1999, 40 years after Korea's economic boom, Korean women still earn only 55.6% of what men earn and in Taiwan, women earn 60% of what men earn. Moreover, wage differences in these regions have actually been increasing since the 1980s.

### **1.3. Conclusion**

The overview of the theoretical and empirical analysis concerning the impact of women's empowerment shows that it is nowadays recognised that women's education and employment greatly contribute to a country's macroeconomic growth performance. This finding is supported by the models discussed in this chapter as well as by the presented empirical studies. Furthermore, the finding that gender specific inequalities reduce growth is in line with today's knowledge that inequalities of any kind reduce growth, for example due to an inefficient allocation of resources caused by wrong selection mechanisms or due to social conflicts (c.f. for example Bénabou, 1996; Alesina and Perotti, 1996).

However, the analysis also showed that this insight has not always been so intuitive and generally accepted as it is now, neither on the theoretical nor on the empirical side. Exogenous growth models, mainly developed in the 1950s and 1960s, did not attribute a positive impact of human capital on growth, and hence according to these theoretical

frameworks, gender discrimination in education does not impact a country's economic growth performance, neither in a positive nor in a negative way. It was not until the 1990s that endogenous growth models did not only consider human capital, but also its gender-specific distribution as a growth determinant and modelled a negative impact of gender discrimination in terms of education on growth. Other endogenous growth models that suggest a negative impact of gender discrimination in terms of employment and income followed soon thereafter.

The overview of empirical studies estimating the impact of women's empowerment on growth also shows that the assertion that a reduction of gender discrimination is growth promoting has not always been proven easily in empirical terms. The first estimations found a negative impact of women's education on growth. However, it did not take long until this finding was disproved by other empirical studies that took into account methodological problems more accurately and applied estimation corrections. Hence, recent empirical studies unanimously prove a purely positive impact of women's education and employment on growth. Therefore, while there is undeniable social value in dismantling discrimination in terms of education and employment of any kind, a reduction in gender discrimination no longer can be seen as an "aim of its own", but is also meaningful in economic terms. Moreover, the presented empirical studies even risk to underestimate the positive impact of women's education and employment on growth because of data quality problems. As women's household and child rearing activities are not measured, women's advances in productivity within private realms remain unaccounted for. Measures of female labour market participation risk to be underestimated because female work is often informal and therefore unrecorded and non-paid work (i.e. contributing family workers) and independent work (i.e. street vendors) are rarely included in the statistics.

The overview of empirical studies also shows that there is no empirical evidence for a growth promoting effect of women's income. We have seen that gender-specific wage discrimination (that is, lower compensation for women than men that is not explained by differences in education) can have a positive impact on growth. Nevertheless, this finding is valid only under special conditions. These conditions occur especially in semi-industrialised export-oriented countries, namely in South-East Asia. Here, producers in manual labour intensive fields achieve a comparative advantage by paying lower female wages than producers in other countries. Women are faced with pure wage discrimination, as their productivity far exceeds their wage compensation. At the same time, cheap production and a relatively qualified workforce allow these countries exporting worldwide at low prices, which, -in turn-promotes growth. Nevertheless, it is questionable that the growth promoting effect of gender discrimination in terms of income is universally valid. We have seen several theoretical

arguments which suggest a positive impact of women's income on growth. For example, higher wages for women can be growth promoting due to an increase in savings and consumption as well as an increase in investments in health and education of children. These arguments suggest that further empirical research is needed concerning the impact of women's income on macroeconomic growth.

## **2. Link two: The impact of macroeconomic growth on women's economic empowerment**

This section discusses a series of theoretical models and empirical studies that investigate the impact of macroeconomic growth on women's economic role in terms of employment. The previous section has shown that it is nowadays recognised that gender differences in employment lower a country's growth performance. This section shows that the reverse impact of growth on women's employment is still much less clear, neither in theory nor on the empirical side.

Firstly, I show that on the theoretical side, there are two different approaches explaining the impact of growth on female labour market participation. The first approach suggests an increase of female labour market participation across all stages of economic development. This approach is called the "modernisation neoclassical approach", based on Becker (1957), and has been enhanced by arguments by Trinker (1976) and Standing (1999). The second approach supports the "feminisation U" hypothesis, which suggests a convex impact of growth on female labour market participation. According to this approach, in early stages of development growth first lowers female labour market participation, and increases it in the middle and long run only, at higher stages of development. The "feminisation U" hypothesis is based on Boserup (1970). I finish the theoretical overview by showing how Goldin (1994) develops and completes Boserup's approach by introducing further arguments.

In a second step, I present the most important empirical findings concerning the impact of growth on female labour market participation. The descriptive and empirical studies presented in this section all test the "feminisation U" hypothesis, but none of them clearly prove its validity. I discuss descriptive time series studies by Goldin (1994), Marchand and Thélot (1997) and de Vries (1994), which suppose a U-shaped pattern of female labour market participation along a country's economic development path. Yet the validity of the findings is weakened by measurement problems. I show that empirical cross-country studies by Goldin (1994) and Cagatay and Özler (1995) also assume the "feminisation U" hypothesis, but like the time series studies, they suffer from data weakness and therefore do not yield precise results. Furthermore, I elaborate that the shortcoming of the empirical results is also caused by endogeneity problems that are not sufficiently taken into account by the applied estimation methods. Finally, my detailed analysis of today's scientific consensus concerning the impact of growth on female labour market participation shows that the lack of clear empirical findings represents a research gap.

## **2.1. The impact of growth on women's empowerment in theory**

### **2.1.1. The positive impact of growth on women's labour market participation: the “modernisation neoclassical approach”**

Early studies within a neoclassical economic approach suggest that gender inequalities decline with economic growth (c.f. Mincer, 1958; Weiss, Ramirez and Tracy, 1976; Norris, 1987; Clark, 1991). The most systematic presentation of this approach is given by Becker (1957), known as the “modernisation neoclassical approach”.

Becker's (1957) assumptions in his standard neoclassical model lead to the conclusion that any sort of discrimination can only be temporary. Discrimination cannot prevail in a competitive environment, because discrimination is not consistent with an agent's optimal behaviour that maximises income or utility. In his model, Becker presents two groups with similar productivity profiles, white and afro-American workers. The model shows that in the presence of some employers who prefer profits to prejudice (competitive condition), all workers are employed and paid the same wage. In the following, I show how Becker's model can be adapted to the case of gender discrimination.<sup>11</sup>

Like Becker (1957) does with white and afro-American workers, I treat male and female workers as two separate groups or sectors, as if they were separate countries in an international trade model. I analyse discrimination under the assumption that the male sector has a higher ratio of capital to labour than the female sector. If there is no discrimination, a capitalist in the male sector would export capital (or import labour) to the point where the marginal products of capital (and labour) are equal in both sectors.

Men and women have identical production functions:

$$Y_m = f(L_m, K_m - E) + f_{k_w} E \quad (8.1)$$

$$Y_w = f(L_w, K_w + E) - f_{k_w} E \quad (8.2)$$

with:

$Y_m$  : total real income of the men's sector

$Y_w$  : total real income of women's sector

$f$  : common production function

$L_m$  : quantity of labour used in men's sector

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<sup>11</sup> Adoption based on Becker's (1957) model presented by Krueger (1963).

- $L_w$ : quantity of labour used in women's sector  
 $K_m$ : men owned capital stock  
 $K_w$ : women owned capital stock  
 $E$ : quantity of capital exported by men's sector

The production function  $f$  is assumed to be first order homogenous and twice differentiable. The marginal products of labour and capital ( $f_L$  and  $f_K$ ) are positive. The second partial derivatives of output with respect to labour and capital ( $f_{LL}$  and  $f_{KK}$ ) are negative.

Men's real output is the total output produced in the male sector plus the payment received by exported men's capital used in the female sector. Women's real output is the total output produced in the female sector minus the payment to imported men's capital used in the production in the female sector.

The sum of men's and women's incomes  $Y_t$  is maximised when the marginal product of capital in the male sector equals the marginal product of capital in the female sector:

$$Y_t = Y_m + Y_w = f(L_m, K_m - E) + f(L_w, K_w + E) \quad (8.3)$$

$$\frac{\partial Y_t}{\partial E} = -f_{k_m} + f_{k_w} = 0 \quad (8.4)$$

If the marginal product of capital is equal in the male and female sector, the marginal product of labour must also be equal in the two sectors.

To maximise men's income, one has to differentiate partially with respect to capital exports:

$$\frac{\partial Y_m}{\partial E} = -f_{k_m} + f_{k_w} + f_{kk_w}E = 0 \quad (8.5)$$

For a maximum:

$$f_{k_m} = f_{k_w} + f_{kk_w}E \quad (8.6)$$

Since  $f_{kk_w} < 0$ , the marginal product of capital in the male sector  $f_{k_m}$  should be lower than the marginal product of capital in the female sector  $f_{k_w}$  to maximise men's income.

The assumption that capital will be paid its marginal product implies the demand for capital in the women's sector. The elasticity of demand for imported male capital in the female sector,  $n_d$ , will be the elasticity of demand for capital weighted by the inverse of the proportion men's capital represents of total capital used in the women's sector.

If  $n_k$  is the elasticity of demand for capital and  $f_k$  is the price of capital, then

$$n_k = \frac{1}{f_{kk}} \frac{f_k}{K} \quad (8.7)$$

since  $K = K_w + E$

$$n_d = \frac{1}{f_{kk}} \frac{f_k}{E} = \frac{1}{f_{kk}} \frac{f_k}{K} \frac{K_w + E}{E} = \frac{n_k}{r} \quad (8.8)$$

where  $r = \frac{E}{K_w + E}$

substituting into equation (8.6):

$$f_{k_m} = f_{k_w} \left[ 1 + \frac{1}{n_d} \right] \quad (8.9)$$

Since  $n_d < 0$ , men will maximise their incomes by having a lower price (marginal product) of capital in their own sector than in the women's sector. This is similar to national trade theory: men, who behave as perfect competitors concerning their allocation of capital, will do less well than if they impose an optimum tax. This is analogous to a sector, which can improve its own welfare by imposing an optimum tax being faced with a less than perfectly elastic supply curve.

If men are concerned only with maximising their own incomes, the optimal differential between home and foreign returns (the "optimum tax") will be:

$$l_m = \frac{-1}{n_d + 1} \quad (8.10)$$

Hence, men's aggregate income may increase with appropriate discrimination against exporting capital to the women's sector. Yet, in the male sector, capitalists' income would be lower if discrimination were not practiced. Moreover, men's labour income would be higher if discrimination was not practiced. Consequently, in the case of full employment in the male sector, capital owners in the men's sector would not discriminate if they would maximise their own incomes and had no preference for discrimination.

Hence, what Becker (1957) showed for the discrimination of white against afro-American workers is valid for the case of gender discrimination in the labour market, too: the disparities in education, employment and income between men and women are supposed to decrease with increasing growth, because countries have to be competitive. This can be illustrated with the help of the example of market expansion. Market expansion represents the competitiveness of a country and goes hand in hand with economic growth (cf. Rodrik, Subramanian and Trebbi, 2004). Market expansion not only requires producer goods but also human capital. In order to foster human capital, it becomes necessary for countries to improve access to human capital resources. Discriminating women in terms of education lowers a county's average human capital stock (or in other words the country's potential "talent-pool", c.f. Klasen, 2002). Consequently, girls and women receive more education with increasing market expansion and growth. This enables them to enter the labour market. Furthermore, higher female participation in the labour market leads to higher competition between men and women. If men and women are equally qualified, discriminatory practices such as the payment of higher wages to men entail additional costs for the employers. Hence, with perfect competition, competition between male and female workers reduces discriminating practices (c.f. Aigner and Cain, 1977; Goldberg, 1982; Lundberg and Startz, 1983).

Becker's model supposes that persisting inequalities between two groups of workers are mainly caused by average differences in the expected value of productivity. An individual's productivity is determined by his or her level of human capital (education, skills and expected length of labour market participation). According to this approach, persisting inequalities in employment and income between men and women are only due to differences in their levels of human capital. These human capital differences go back to the gender-specific traditional division in the family, which implies that women accumulate less labour market experience than men. Furthermore, because women anticipate shorter and more discontinuous careers, they invest less in formal education. Lower education and lower work experience reduce their human capital stock and consequently lower their earnings relative to those of men. Becker

(1985) also postulates that the longer hours that women spend on housework may also decrease the effort women put into their professional careers, which also has a detrimental effect on their productivity and their wages. Hence, differences in human capital can explain persisting gender inequalities in employment and income, but according to Becker's model differences in education, and hence in employment and income, are supposed to decrease with increasing growth and market expansion.

Dollar and Gatti (1999) enhance Becker's arguments by emphasising that market expansion assumes a reduction of all sorts of market imperfections. Some of these market imperfections hinder women-specific investments. For example, in many developing countries, an imperfect pension system makes parents to rely on sons' support for their retirement, thereby favouring male education. This market failure, which leads to an underinvestment in women's education, declines with rising economic growth as the country fosters its capital markets and hence develops capital-covered pension systems.

This implies that the expansion of markets leads to a greater reliance on the functioning of free market mechanisms. The achievement of optimal resource allocation including labour becomes an important factor for growth. Sociological theoretical arguments complete this approach: Durkheim (1964) and Weber (1978) highlight that gender-discriminatory practices in employment hinder the functioning of market mechanisms as they represent traditional structures and patriarchal norms, often justified by religious beliefs. Ramirez, Soysal and Shanahan (1997) confirm that overcoming traditional norms significantly contributes to a reduction of gender differences in the labour market. This overcoming is „increasingly a product of the transnational environment rather than of local or national forces”.

Yet, Becker (1957) qualifies his conclusions, enlarging his model by introducing a “taste for discrimination” (not formalised here). The introduction of a preference for discrimination acknowledges that existing gender gaps in employment may partly be due to the persistence of “pure discrimination” (employment and income gap despite gender equality in education and qualification). This discrimination can arise due to the discriminatory tastes of all sorts of agents, as employers for example. In the model, the assumption that capitalists in the male sector prefer to use their capital only within the male sector would represent such a taste for discrimination. Such capitalists can be induced to export capital to the women's sector only at a sufficiently compensatory return, which is a higher return than they get at production in the men's sector. In case of an export of capital to the women's sector, the extra return can be seen as a payment to offset the “costs” (here in terms of utility) to capitalists of exporting capital to the female sector.

In addition to Becker's additional insights, there are a series of other studies that focus on the persistence of gender discriminating practices in terms of wage income. Trinker (1976) and Ward (1984) for example, suppose that, on the one hand, growth raises women's education and labour market participation, but can increase gender segregation and gender wage differences at the same time. This approach is supported by many governments' gender and development (GAD) aid programs, for example the AUSAID (Australian Government's Overseas Aid Program) and therefore is called the "GAD-approach". Trinker (1976) and Ward (1984) argue that neither high levels of economic prosperity nor development of women's "human capital" through education and work experience necessarily result in increased income for women, not to mention in increased access to authority positions for women. This is because gender discriminating practices in pay provide benefits for employers due to the opportunity to employ discriminated groups at relatively lower wages (c.f. also Darity, 1989).

This argument was taken up and developed further by Standing (1999). Standing argues that globalisation supports the feminisation of the labour market, but worsens the gender-specific income distribution. Since the 1970s, there has been a strong growth of international trade in goods and services, increasing foreign direct investments and a reinforced international division of labour. The importance of cost cutting increases the emphasis on labour costs. Consequently, across the globe, countries are confronted with erosions of labour regulations and social protection systems. Less regular full-time work, more informalisation of employment, more temporary labour, part-time labour and less protection of labour interests are on the advance. The globalisation-led shift towards casual labour, outsourcing, part-time work, home working and sub-contracting reduces job security and hence favours women's employment. Furthermore, competitive countries are those who dispose not only of cheap and flexible labour, but of skilled labour at the same time. Consequently, countries in which workers earn less as workers in other countries with the same qualifications and productivity, dispose of a Ricardian comparative cost advantage. The demand for skilled, but low paid and flexible work increases the proportion of women occupying jobs. With their comparative advantage in relatively low labour costs, developing countries have a chance to participate in global trade. We have already seen that Seguino (2000, 2005) empirically proved Standing's arguments for export-oriented, growing tiger economies in South-East Asia. Seguino illustrates Standing's arguments by substantiating that in these countries, globalisation has led to a large increase in the share of export-led labour-intensive manufacturing in the 1980s and until the late 1990s, which benefitted the employment of women. Female labour market participation is rising sharply, especially in the manufacturing sectors (textile, footwear,

garment, electronics...), but the jobs in these sectors do not offer status or the chance of accumulating technical skills for women and mostly imply low pay as well as insecure and bad working conditions.

### **2.1.2 The convex impact of growth on women's labour market participation: the “feminisation U” hypothesis**

The “feminisation U” theory, supposing a convex impact of growth on women's labour market participation, goes back to Boserup (1970). This approach emphasises, more so than Trinker (1976) and Standing (1999), the vulnerability of women over the course of economic development. While Trinker (1976) and Standing (1999) suppose that growth raises the female labour market participation but may reinforce segregation and gender wage discrimination, Boserup (1970) supposes that growth can also lower female labour market participation. In the “feminisation U” theory, which is supported by the WID (Women in Development)<sup>12</sup> program and therefore is also known as the “WID-approach”, Boserup (1970) argues that there is a curvilinear relationship between economic growth and women's employment: Growth first lowers female labour market participation, and then increases it in the middle and long run.

The arguments behind the convex impact of growth on female labour market participation that is suggested by Boserup (1970), are best illustrated as three stages:

#### *Stage one: high female labour market participation in developing countries*

In developing countries, characterised by low income standards and a large agricultural sector, women's labour market participation is high. Most women work on farms in home workshop production. They either pursue subsistence activities or work as contributing family workers or as self-employed workers. This activity “at home” allows women to have children at the same time. Women in developing countries have a strong incentive to have children, because the number of children raises the family's income and status, older children can work as contributing family workers at the farm and adult children care for the parent's old-age security. Moreover, other family members such as grandparents live at the same place and hence are available to care for younger children. Consequently, in developing countries, both female labour market participation rates and fertility rates are high.

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<sup>12</sup> The WID is an institution of USAID (an independent federal government agency that receives overall foreign policy guidance from the Secretary of State in the USA).

### *Stage two: falling female labour market participation in industrialising countries*

At the beginning of the economic growth process, urbanisation and industrialisation polarise working activities of men and women and therefore increase gender differences in employment and income. Firstly, the reduction of the rural sector as well as the growing demand for labour mobility make it more difficult for women to combine family and work. Family networks weaken or dissolve and children become a barrier to women's wage employment. Secondly, industrialisation and technological change lower the demand for low-skill workers relative to workers with technical and high level skills that are important to operate machines or computers. Men find work more easily in industrialised sectors than women, because they have privileged access to education and hence can adapt more easily to new production technologies. Men earn more now and are able to financially maintain the family on their own. Hence, urbanisation and industrialisation initially reduce female labour market participation, mainly due to structural change and an income effect. Boserup (1970) stresses that the polarisation and hierarchisation of men's and women's work roles in times of industrialisation also result from individual preferences of both employers and workers that become embedded in discriminatory practices within institutional arrangements. During the industrialisation process, well paid job positions that offer career perspectives are still limited and only slowly become accessible to a broad mass of workers. Consequently, men tend to monopolise access to technological innovations and education in order to outstrip competitors. Moreover, women face labour restrictions due to their childcare responsibilities. This raises their relative labour costs, which leads to employers' preference for male workers.

### *Stage three: rising female labour market participation in developed countries*

With further economic development, female labour market participation rises due to mechanisms known from the modernisation neoclassical approach. The exclusion of women from wage activities results in tight labour markets and in a rising demand for female workers. Competitive countries are urged to optimise their "talent pool", and consequently, women receive more education and training. Employment opportunities for women increase, which raises women's opportunity costs of staying at home. Domestic labour gets commodified and fertility rates decline. Therefore, female labour market participation increases in the medium and long run, mainly due to women's adaption to the new qualification and requirement profiles of the labour market and a dominating substitution effect. Boserup (1970) adds that in the long run, shifts in the distribution of political power accompanying the process of democratisation may promote greater intolerance against discriminatory practices, including gender discrimination.

Based on Boserup's arguments, Goldin (1994) presents a theoretical framework to illustrate the changes in women's labour market participation across all stages of economic development. Goldin complements Boserup's arguments by suggesting that women's decrease in paid work during a country's industrialisation process appears not only through an income effect, but also depends on the existence of social norms. Goldin states that factory work, which increases during early stages of industrialisation, is abhorred by most married women, which can not exclusively be explained by the absence of women's specific skills in manufacturing and machinery. Social norms imply a "social stigma" against married women working in manual occupations, which are "dirty and physical" labour in factories, away from home. This is because a husband who lets his wife work in manual labour is seen by society as "lazy" and "incapable" to provide for his family. Not only in developing countries, married women who stay at home are seen as a signal of the family's prosperity and wealth. For example, the fact that until recently, many married women in Germany stayed at home, could be interpreted as "phenomenon of the middle class", serving to distinguish oneself from poorer families (prosperity effect, c.f. Fagnani, 2004). However, the social stigma against married working women does not exist for clerical work (office work, sales, teachers, nurses etc...). This can be attributed mainly to the fact that clerical work stands for higher and high education levels, which can be interpreted as a woman's social "licence" to work for pay. Goldin illustrates this by saying that "a married woman working in the clerical sector can have either a lazy and poor or a hardworking and rich husband". Hence, women's work in the clerical sector does not allow society to infer a family's social status from the woman's activity, and thus the social norm can not take effect.

In order to model a convex impact of growth on female labour market participation, Goldin (1994) presents two frameworks, one which takes into account the existence of a social stigma and one which presents a non-stigma equilibrium. Both frameworks obtain a U-shaped female labour force function with increases in per capita income, but the evidence for the "feminisation U" appears more consistent in the stigma-case.

Goldin (1994) assumes:

- A married woman can produce a good  $G$  either in a factory or at home.
- $G$  produced by the firm and  $G$  produced at home are perfect substitutes (textiles for example).

- Poorly-educated women can work in the factory as blue-collar workers (operatives, manual or machinery work). Higher educated women can work in the factory as white-collar workers (office work as clerical assistance, for example).
- Women can use time  $T$  in three different ways: for production of  $G$  at home, for production of  $G$  at the factory and for child care  $C$ . There is no leisure time.
- The amount of good  $G$  produced by a family is governed by a production possibilities frontier ( $PPF$ ). An increase of the family's income lifts the  $PPF$  by  $\Delta G$ .

Women's utility function is given by:

$$U = U(G, C) - \delta S \quad (9.1)$$

$S$ : utility value of the social stigma

$\delta$ : 0/1 indicator variable:  $\delta = 1$  if the woman works in the blue collar sector

Goldin (1994) considers 3 periods:

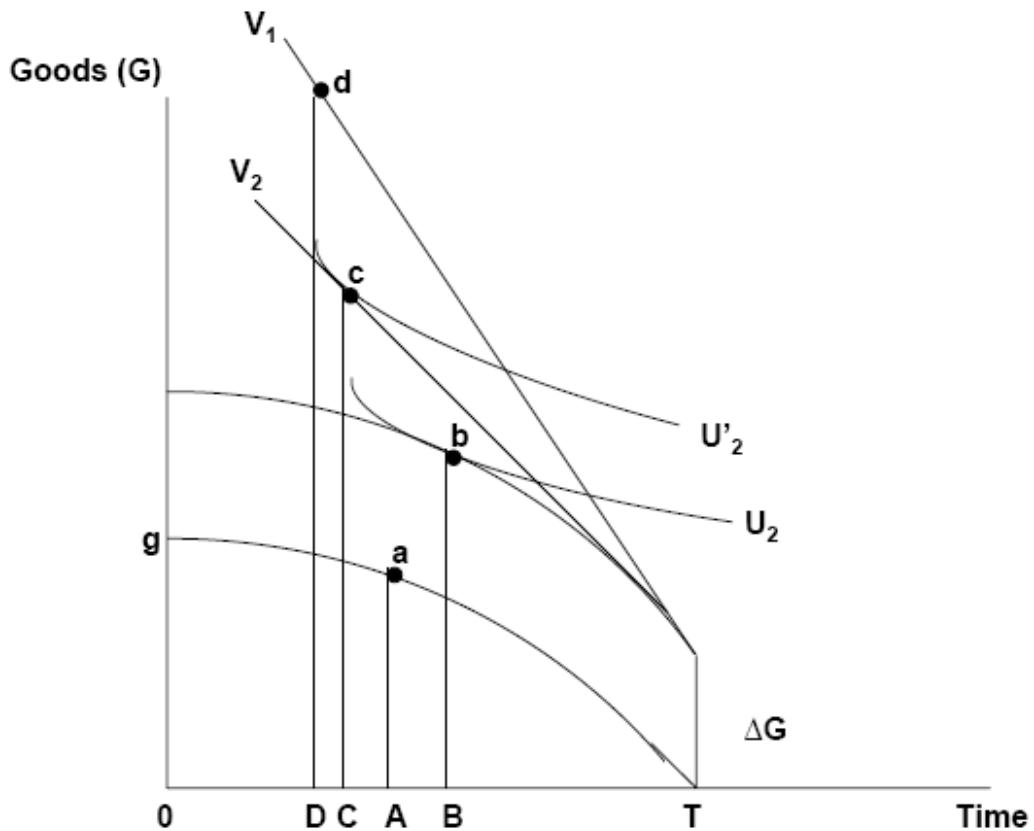
Period 1: developing country:  
no employment options in factories, neither for wife nor for husband

Period 2: early industrialisation process:  
appearance of a factory  
first: male education rises, husband works in factory  
then: wife gets option to work in factory as blue-collar worker  
→family income rises

Period 3: industrialised country:  
female education rises time-lagged to male education;  
wife can work in factory as white-collar worker  
→family income rises further

Figure 6 shows the time allocation choice of a married woman.

**Figure 6: Time allocation choice of a married woman**



Source: Goldin (1994)

- Period 1: initial position: point *a* on the *PPF*  
 wife works  $AT$  hours in home production to produce  $G$   
 and  $OA$  hours for child care  $C$
- Period 2: appearance of a factory  
 first: husband's income increases lifts *PPF* by  $\Delta G$ : point *b*  
 wife reduces time of home production to produce  $G$  to  $BT$   
 and increases hours for child care to  $OB$   
 (pure income effect)  
 then: paid work in blue collar sector is offered to wife  
 assumption that wife's wage (relative to price of  $G$ ) exceeds the  
 slope of the *PPF* at point *b*: line  $v_2$

- ▷ no stigma-equilibrium:  
 no home production of  $G$ , but production of  $G$  by wife in factory rises  
 family income and therewith utility from  $U_2$  to  $U'_2$   
 point  $c$ : increase of time for  $G$  production to  $CT$   
 and decrease of time for childcare to  $0C$
- ▷ stigma-equilibrium:  
 wife hesitates between point  $c$  and point  $b$ :  
 work in blue collar sector raises family income and therewith  
 utility from  $U_2$  to  $U'_2$ , but social stigma  $S$  lowers utility  
 if  $U'_2 - U_2 > S$  wife moves from point  $b$  to point  $c$   
 if  $U'_2 - U_2 < S$  wife stays at point  $b$

Period 3: wife gets work opportunity in white collar sector:  
 further wage increase: line  $v3$   
 point  $d$ : woman increases time for  $G$  production in factory to  $DT$   
 and decreases time for childcare to  $0D$

In both equilibria, the non-stigma and the stigma-equilibrium, female labour market participation first decreases and then increases across the process of economic development, provided that women's employment opportunities in both the blue-collar and the white-collar sector arise time-lagged to those of men. Furthermore, Goldin's model shows that in the stigma-case, the increase in female labour market participation is delayed in comparison to the non-stigma equilibrium. Hence, the U-shape of a curve illustrating the convex impact of economic growth on women's labour market participation would be more pronounced in the social stigma case in comparison to the non-stigma case.

Boserup (1970) and Goldin (1994) list a range of determinants that help understand the impact of growth on female labour market participation. Among them, there are education and technical knowledge, fertility, migration into cities and falling apart of family networks. There are many other possible determinants, economic and non-economic ones. The non-economic determinants are more difficult to quantify and therefore rarely find their way into theoretical or empirical frameworks. Yet, by introducing the existence of social stigma into the model, Goldin (1994) takes into account an important non-economic determinant of female labour market participation. Other non-economic determinants were mentioned in the previous section, as traditional patriarchal structures and norms that can be based on religious beliefs (c.f. Weber, 1978) or on the taste for discrimination (c.f. Becker, 1957).

There are many other important determinants to mention. In order not to go beyond the scope of this work, I do not give a complete overview and limit the discussion to some examples. One may think, for example, of the impact of medicine on women's labour supply and fertility decisions. The World Bank (2001) emphasises that medical advancement lowers fertility rates, as women are less confronted with infant mortality. Hence, medical advancement contributes to explain rising female labour market participation rates across the process of economic development. Furthermore, institutional arrangements play a role for female labour market participation, like for example the form and the functioning of pension systems (capital based pensions or pay-as-you-go financing or dependence of family members, statutory retirement age, amount and duration of entitlements, voluntary or obligatory payment of contributions etc., c.f. Sinn, 2004). Another important factor for female labour market participation is a country's institutional arrangement to encourage a reconciliation of work and family life (c.f., OECD, 2007). Today, in many developed countries, family policies are seen as one of the most important factors that determine women's fertility and labour supply decision.

Chapter 3 presents a detailed discussion of the impact of family policies on female labour market participation in Europe. Another important determinant of female labour market participation is the advancement of legal equality between men and women in the course of a country's economic development. Legal protection against discriminatory labour practices certainly encourages female labour market participation, but is an achievement that can be attributed to highly developed countries only. Even in these countries, the effective implementation and control of antidiscrimination laws is not always assured (c.f. OECD, 2007). In a wider sense, legal and effective protection from political instability, lawlessness as well as violence and intimidation within and outside the household play also an important role on women's decision-making ability in terms of labour supply. Other labour market aspects such as working conditions or unemployment rates can also be seen as determinants of female labour supply. The "added-worker effect", for example, states that unemployment of husbands leads to an increase in the wife's labour supply due to the risk-sharing arrangement of marriage (c.f. Serneels, 2002). Touching on labour supply decisions, it becomes clear that mechanisms of intra-household decision making, as discussed by Chiappori (1988), for example, may be worth considering more concretely. Not only macro- but also micro-determinants may help explain the evolution of female labour market participation. As this chapter focuses on macro-economic determinants of female labour market participation, a detailed discussion of intra household decision processes at this point would go beyond the scope of this chapter. The analysis of the impact of family policies on

female labour market participation proposed in chapter 3 takes into account intra household decision processes more precisely.

## **2.2. Empirical evidence of the impact of growth on women's labour market participation**

On the empirical side, previous studies could not identify a clear effect of growth on female labour market participation. On the one hand, in most Western economies the economic situation of women in a wider context increased with growth during the last decade, supporting the modernisation neoclassical approach. On the other hand, there is evidence in support of criticisms brought up by Trinker (1976) and Standing (1999). Deininger and Squire (1996), for example, find no systematic effect of growth on the change of income distribution between men and women. They find that growth can even increase gender inequalities in income. Furthermore, Deininger and Squire (1996) suppose that one can not say that growth clearly lowers gender inequalities even when focussing only on employment. An example that illustrates this assumption would be Saudi Arabia: With a yearly GDP per capita of 8.974 US\$ in 2004, Saudi Arabia belongs to the 20% of the richest countries in the world, but at the same time Saudi Arabia has one of the lowest female shares of the labour force (15%) in the world and women suffer from severe repression (i.e. obliged to wear a headscarf in public, forbidden to drive a car, male tutelage...). A counter-example is countries of the former Easter Bloc: despite relatively low GDP-level, in the 1980s and early 1990s these countries had relatively high levels of female labour market participation. For example, in 1990, Slovakia denotes a female share of the labour force of 46% and a GDP per capita of 3.703 US\$.<sup>13</sup> Hence, the assumption that GDP growth invariably promotes female labour market participation has to be put into question.

There exists a series of empirical studies that intend to verify empirically the “feminisation U” hypothesis. Some of them are time series studies; others focus on cross country data. Yet, measurement and estimation problems inhibit clear and universal conclusions.

### **2.2.1. Time series analysis**

Several time series studies - in this work exemplified by Goldin (1994), Marchand and Thélot (1997) and de Vries (1994) - suggest a U-shaped progression of women's labour market

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<sup>13</sup> Data for Saudi Arabia and Slovakia: World Bank World Development Indicators (2006).

participation across the process of economic development. Yet, as these studies are based on the observations of single countries and therefore focus on within-country variation only, they do not prove the universal validity of the “feminisation U” hypothesis. Furthermore, these studies substitute economic growth with time, suggesting that a country’s income level grows constantly over time. Hence, the presented studies observe the evolution of women’s labour market participation in the course of time, yet they do not propose empirical estimations of the impact of a country’s growth or income level on female labour market participation. None the less, in comparison to cross country studies (presented in the following section), the existing time series studies provide a closer look at country-specific determinants that help understand why there is a convex impact of growth on women’s labour market participation.

Goldin (1994) observes the evolution of women’s labour market participation between 1890 and 1980 in the United States. She states that for the USA, one has to edit and adapt data from the nineteenth century to today’s measurement standards to be able to observe the declining branch of the “feminisation U”. Data for the nineteenth century is very fragmentary and the definitions and methods of data collection at that time were very heterogeneous, which causes serious measurement problems.

If one used the available data as it is, the “feminisation U” would not be observed. This is because at the end of the nineteenth century, US citizens were registered as participants of the labour force only when their occupation could be seen as “gainful employment”. Consequently, women who worked intermittently or only a few hours a week were not reported. According to Goldin (1994), the social stigma for women working in manufacturing also contributed to the fact that not all working married women were actually reported as working. Besides, contributions to family work and black market activities were not reported either. So, in 1890, women’s labour market participation was listed at 3% only. The official statistics show a constant rise from 1890 on up to 49,3% in 1980. Hence, a falling portion of the U is not visible in official data. Consequently, the rising female labour market participation dominates the US literature on female labour market participation in the twentieth century, supported by theories that emphasise a permanent domination of the substitution effect over the income effect (c.f. for example Mincer, 1962).

However, Goldin’s archival research indicates that a greater percentage of women than reported were economically active in the end of the nineteenth century. Unregistered, but economically active women were for example those who produced for the market sector or took part in their husband’s trade when business was operated in the family’s domicile. According to Goldin (1994), new adjusted estimations based on today’s knowledge yield a

female share of the labour force of 15% for the end of the nineteenth century. The bottom was reached around 1920 approximately, and from the 1920s on female share of the labour force rose continuously.

The reasons given by Goldin (1994) for the fall in the early twentieth century are rather vague. Goldin points out that in this period, a strong income effect must have dominated a weak substitution effect due to relatively low female wages. Furthermore, changes in agricultural technology may have reduced the demand of female workers. Goldin's further analysis is focused on the reasons for the turn in the curve progression in the USA in the 1920s. Goldin finds out that the change in women's locus of production from the home to the factory has occurred some time after a strong increase in secondary schooling for boys and girls. From 1910 to 1950, secondary school enrolments and graduation rates advanced remarkably. The strongest increase was recorded from 1920 to 1937. For example, the graduation rate in non-South regions of the USA rose from less than 10% in 1910 to about 50% in 1937. As early as 1920, girls were 1, 25 times more likely to graduate from secondary schooling than boys all over the country. The gender neutral investments in educational attainment in the USA were due to a universal public funding of primary and secondary schooling. In the beginning of the twentieth century, the US still faced important resource constraints that lead male education to be favoured. From 1910 on, economic growth freed resources and female secondary education levels converged to those of males.

However, to explain the curve's turning point, not only secondary schooling but also the social stigma for married women working in the blue collar sector and rising wages in the clerical sector have to be considered as key points. Girls attended secondary and higher schooling for longer periods than boys. This is because due to social stigma, it was advisable for girls to avoid a manufacturing job and to get an office job. In addition, wages in the clerical sector began to rise in the 1920s and attained a maximum in the 1950s and 1960s, which is why a substitution effect came to dominate. The clerical sector first offered women jobs as typists, stenographers or secretaries, but rather soon the field was expanded, for example to sales, teaching and nursing. In this context, Goldin (1994) suggests a "feminisation" of the clerical sector: In 1890, 15% of office workers were female and only 4% of them were married. In the 1920s, 50% were female and 26% were married, and in the 1950, 62% were female and 42% were married.

The rise of secondary school enrolments and graduation rates and the rise of office work in the 1920s and 1930s were important components of the increase in women's labour market participation in the 1950s. Besides, the female work force was increasingly composed of

married women working in the clerical sector and older than 40, whereas before 1920 young unmarried women working in manufacturing formed the majority of the female US-American work force. Hence, the fact that it became socially accepted for married women to work allowed them to stay in the labour market longer.

As Goldin (1994) does for the USA, Marchand and Thélot (1997) observe male and female labour market participation for France. They make statements about the evolution of male and female activity rates from 1800 onwards. One more, the principal difficulty is access to data. In France, the first credible population census was made in 1896, then in 1946 and in 1954, implying that data for the nineteenth century is very fragmentary and measurement methods are heterogeneous. Marchand and Thélot (1997) state, that the active population has doubled within two centuries and that in general, one can observe a feminisation of the active population over the whole observed time period. However, at looking precisely on the data, like Goldin (1994), Marchand and Thélot (1997) confirm the "feminisation U" hypothesis. Similar to Golding's findings for the USA, they find out that in France the female activity rates decreased during the first half of the twentieth century. In contrast to the US, in France female activity rates increased significantly only from the 1950s on. They obtain the highest level at the end of the observed period, which is the end of the twentieth century.

De Vries (1994) analyses the evolution of female labour market participation from 1700 to 1980 in Britain, the first land of Western industrialisation. Over the whole observed period, De Vries (1994) finds a "double U" in the evolution of female labour market participation, with a minimum point around 1700 and around 1950. During the eighteenth century, De Vries (1994) confirms a continuous rise in female labour market participation. He suggests a revision of the history of industrial revolution in Britain by introducing the term "industrious revolution" for the country's economic occurrences in the eighteenth century. The term serves to supplement the well known term "industrial revolution" which stands for the economic occurrences in the nineteenth century. According to de Vries (1994), the eighteenth century in Britain was characterised by an extension of urban networks, growth of agricultural output and fertility changes as well as mortality changes that facilitated industrialisation. Growth rates and wages were low, but at the same time de Vries assumes an increasing consumer demand. Focusing on the household and family behaviour in the beginning of the eighteenth century, de Vries confirms an increase in both the households' supply of marketed commodities, the households' supply of labour and the households' demand for marketed products. The initial demand for goods and services for direct consumption changed into a demand for marketed commodities, which lead to an intensification of work. An extensive use of female and child labour (up to exploitation) and a

reduction of leisure time was the consequence. At the same time, human capital formation for women and children was totally neglected in the eighteenth century. In the first half of the nineteenth century, female labour decreased and stayed low until the middle of the twentieth century. The existent family model was replaced by a “breadwinner - homemaker household” model, which De Vries (1994) calls the “capitalistic patriarchy” model. Male full-time labour rose due to an increase in male wages, which lead to a detachment of women from the labour market. The family shifted its focus on a new set of household commodities related to services, health, hygiene, human capital formation, domesticity and comfort of the house (prosperity effect). The period from 1960 to today in Britain represents a second “industrious revolution” for de Vries (1994). He argues that, again, families’ demand patterns have shifted from family-consumed commodities to individualised consumption and market-supplied goods. Consequently, in Britain women’s labour market participation increased significantly from the 1960s onwards.

### **2.2.2. Cross country analysis**

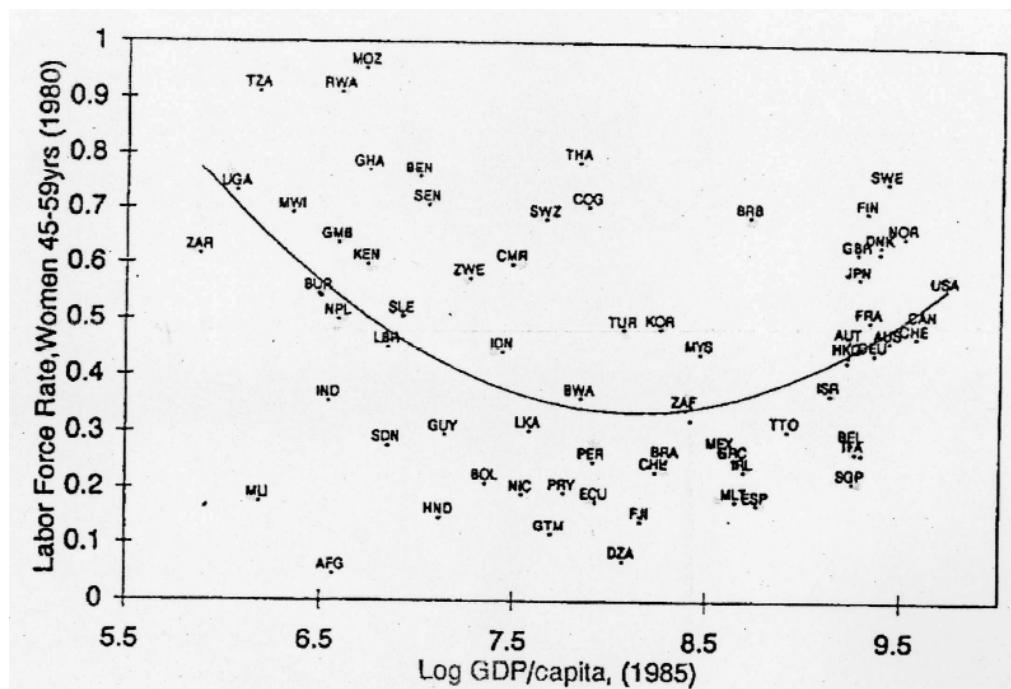
Several cross country studies examine empirically the impact of growth on female labour market participation. In comparison to the time series studies mentioned above, the cross country studies do not substitute economic development with time, but provide empirical analysis based on an estimation model that contains exogenous and endogenous variables. Yet the cross country studies are based on data with limited time periods (pooled data that cover a time period up to 15 years maximum) and therefore focus on between-country variation. The time series analysis shows that a country’s whole U-shaped curve stretches over a much longer time period (at least 60 years for the US, for example). Hence, it is unlikely that the cross country studies can universally prove the “feminisation U” hypothesis, either. Moreover, in comparison to the time series analysis, the cross country studies pay less attention to complex causal relationships and arguments behind the convex impact of growth on female labour market participation.

Goldin (1994) examines the impact of the natural logarithm of GDP per capita on the share of the labour force participation of 45 to 59-year old women. Data on the female share of the labour force comes from the United Nations WISTAT collection. The relatively high age group of women was chosen in order to exclude unmarried women and those whose fertility decisions impact their labour supply decisions. This older age group, however, contains widows and abandoned women, which also makes it difficult to isolate the relevant determinants of the female share of the labour force. Furthermore, within the limited age

group, it is difficult to control for the impact of educational changes, which are more relevant for younger women, on women's labour market participation choices.

Goldin (1994) first graphs the (*log*) *per capita GDP* of 1985 for 68 countries against the *female share of the labour force* of 1980. The graph is shown by figure 7 and suggests a U-shaped relationship.

**Figure 7: Per capita GDP 1985 (nat. log) against female share of the labour force 1980**



Source: Goldin (1994)

In a second step, Goldin (1994) tries to empirically prove an income effect, which decreases female share of the labour force, as well as a substitution effect, which increases the female share of the labour force.

The empirical regression is based on observations of 82 countries, registered in 1980.

The endogenous variable is:

- *Female share of the labour force (45 to 59 year old women)*

The exogenous variables are:

- *% male labour force in white-collar sector*
- *%FCLER*: % female labour force in clerical sector
- *FSCHL*: years of schooling of adult women
- *%FCLER x FSCHL*

The regression results are presented in table 8 in the appendix. The results suggest that the female share of the labour force decreases with an increase in the percentage of men employed in the white-collar sector, indicating a negative income effect on women's labour market participation. Furthermore, the estimated coefficients of the last three exogenous variables shown in the table suggest that the female share of the labour force increases with increases in the share of women in the clerical sector, but only when female education levels are above 7 years (secondary school level). This indicates a positive substitution effect on the female share of the labour force. It is remarkable that the impact of female schooling on the female share of the labour force is significantly positive only when interacting female schooling with the share of women in the clerical sector. This finding may refer to a convex impact of growth on the female share of the labour force. It may be suggested that at low levels of economic development, education increases more for boys than for girls. With the rising income of men, female labour market participation decreases due to an income effect. As economic development proceeds, girls also receive more education, women receive job opportunities on higher wage levels and a substitution effect starts to dominate, which raises women's labour market participation.

Yet, Goldin's (1994) empirical estimation suggests rather than proves the U shaped function of the female share of the labour force with respect to GDP per capita. It is unclear at what levels of economic development female education converges to those of males. Furthermore, it is unclear at what levels of economic development the substitution effect dominates the income effect, which leads to a turn in female labour market participation (curve's minimum point). Moreover, the presented regression model does not explicitly test the hypothesis of a convex relationship between economic growth and the female share of the labour force, as GDP per capita is not modelled as an exogenous variable.

Cagatay and Özler (1995) propose an all-in-one estimation model with the female share of the labour force as endogenous and the natural logarithm of GNP per capita as exogenous variable. They estimate the impact of InGNP per capita on the share of the labour force of 45 to 59-year old women, based on cross-country data that includes observations of 96

countries, pooled for 1985 and 1990. Data on the female share of the labour force comes from the World Bank data bases.

A descriptive analysis of the data shows that the most advanced industrialised regions have experienced a feminisation of the labour market from 1985 to 1990. This concerns Europe, but also the East Asian Caribbean, Latin America and Middle East and North African countries. A defeminisation process can be observed in Sub-Saharan-Africa. At the same time, Cagatay and Özler (1995) emphasise very large variations between countries with respect to the female share of the labour force. The share is relatively high in Sub Saharan African countries in comparison to industrialised regions. Furthermore, the analysis shows that factors other than economic growth seem to have an impact on female labour market participation. These are primarily demographic factors, such as urbanisation, education and fertility, but cultural and ideological factors seem to play a role, too. In Eastern Europe, for example, one can observe high female shares of the labour force, which can be associated with the Socialist commitment to women's economic participation

In order to control for the U-shaped pattern of the female share of the labour force across the process of economic development, Cagatay and Özler (1995) include  $\ln GNP$  and  $(\ln GNP)^2$  as exogenous variables in the regression model. To confirm the "feminisation U" hypothesis, the estimated coefficient of  $(\ln GNP)^2$  must be significantly positive as an indicator of the curve's convexity, which implies that there exists a minimum in the data.<sup>14</sup>

In addition, Cagatay and Özler (1995) want to find out whether structural adjustment policies (SAP) impact the female share of the labour force. These policies intend to reinforce macroeconomic stability and trade openness by focussing on the expansion of export oriented sectors. As we know from Trinker (1976) and Standing (1999), these sectors are labour intensive sectors that favour the employment of low paid women, so it is likely that structural adjustment policies positively impact the female share of the labour force. On the other hand, in countries with persisting gender gaps in education, structural adjustment policies may crowd women out of the labour market, because the expansion of the export sectors requires an adoption of techniques that demand skilled labour.

The endogenous variable of the empirical model is:

- $FSH$ : female share of the labour force (45 to 59-year old women)

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<sup>14</sup> second derivation of estimation equation  $> 0 \rightarrow$  minimum point

The exogenous variables are:

- $LGNP$ : nat. log of GNP per capita measured by the real dollar value of GNP in 1987 U\$ dollars
- $LGNP^2$ : the square of  $LGNP$
- $URB$ : share of urban population (demographic variable)
- $INGP$ : investment share of GNP (indicates the degree of expansion)
- $XGP$ : exports to GNP ratio (indicates trade openness)
- $INFLAT$ : inflation as a proxy for income distribution<sup>15</sup>
  
- $ALA$ : Dummy variable that takes the value 1 for countries that have undertaken a World Bank or an IMF adjustment program
- $EIA$ : variable that takes the value 1 for countries that have received two structural adjustment loans or three adjustment operations or more
- $WBA$ : variable that takes the value 1 for countries that have undertaken a World Bank adjustment program up to two years prior to the year in the sample (to allow time to have an impact)
- $WBA\#$ : weighted dummy variable version of  $WBA$ : weights numbers of adjustments
  
- $AFRICA$ ,  $SOUTHA$  (Southasia),  $MEAST$ ,  $CARAIB$ ,  $LATIN$ ,  $ASIA$ ,  $XSOC$  (former Socialist economies) (geographic region dummies)
- $DUM85$ : year dummy variable

Cagatay and Özler (1995) estimate the model by ordinary least squares (OLS). Region and year dummies control for unobservable characteristics that are not included in the model. Table 9 in the appendix shows the estimation results with  $FSH$  as endogenous variable.

The estimation results of Cagatay and Özler (1995) indicate that the “feminisation U” hypothesis cannot be rejected at high levels of confidence in the sample, as indicated by the “t” values of the positive  $LGNP$  coefficient and the negative  $LGNP^2$  coefficient. Yet, in fact the significantly negative coefficient for  $LGNP^2$  rejects the “feminisation U” hypothesis, and Cagatay and Özler (1995) falsely argue that the “feminisation U” hypothesis can not be rejected.

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<sup>15</sup> Economic theory and empirical evidence suggest a high negative correlation between inflation and income distribution (high inflation worsens the income distribution).  
The economic variables  $INGP$ ,  $XGP$  and  $INFLAT$  are used as long term average values (for 1985: average 1975-1985; for 1990: average 1975-1990).

The significant negative parameter value of *URB*, however, suggests that an increase in the urban share of population leads to a defeminisation of the labour force, which is consistent with the theoretical arguments of the “feminisation U” hypothesis. The intercept terms for African, Caribbean and Former Socialist economies are significantly higher than the omitted group (the industrialised economies), and the intercept terms for Middle East and South Asia are lower. Furthermore, all adjustment variables have a significant positive impact on the female share of the labour force. Cagatay and Özler (1995) prove the robustness of the positive impact of structural adjustment policies on female labour market participation by using alternative measures of income distribution, adjustment policies and demographic indicators, which are not presented here. The estimated coefficients for *LGNP* and *LGNP<sup>2</sup>* stay unchanged. Cagatay and Özler (1995) also include measurements of adjustment policies that take into account economic variables in the regression and conclude, that structural adjustment policies lead to an increase in the female share of the labour force via increased trade openness, but worsen a country’s income distribution, which is in line with Standing (1999) and Seguino (2000, 2005).

Goldin’s (1994) cross country study does not yield precise results to validate the “feminisation U” hypothesis, and the cross country study of Cagatay and Özler (1995) provides contradictory findings. However, it would be premature to reject the “feminisation U” hypothesis, because the estimation results suffer from measurement and estimation problems.

### **2.2.3. Measurement problems**

Measures of female labour market participation are subject to serious measurement errors. There exists a strong risk of underestimating female labour market participation, because female work is often informal and therefore unrecorded. Non-paid work and independent work are rarely included in the statistics. This holds especially for women’s subsistence activities in the agricultural sector in the third and second world (for more precise information about this issue, see box below). Aside from women’s activities in the informal sectors, other working activities, such as household, child-rearing and other family-related activities, are not captured by national accounts. Therefore, changes in the quantity and productivity of these activities can be measured only insufficiently or not at all (c.f. Waring, 1988; Klasen, 2002). The UNDP (1995) shows that in the 1990s, around two third of the female productive activities in developing countries are not captured by national accounts, compared to only one forth of male activities.

### **Background information: women's informal activities in agriculture**

All over the world, women are over-represented in informal employment (c.f. Gideon, 2007; Carr et al, 2000; Chen et al, 1999; Pearson, 2004; Prugl, 1999). Being in informal employment renders women vulnerable to poverty, economic shocks and natural disasters. Low and insecure income on one hand, and lack of any type of social protection on the other, can be detrimental for many women around the world.

Understanding why women are over-represented in informal work compared to men is of primary importance in alleviating the constraints related to it. Multiple factors explain the over-representation of women in informal work and their concentration in low quality jobs. The main factors are:

- Barriers to education and vocal training (c.f. Chen, 2001; Clark, 2003)
- Barriers to credit, to entrepreneurial activities and assistance and to business networks (c.f. Esim and Kuttab, 2002)
- Barriers to entry into specific sectors (segregation) (c.f. Beneira, 2001; Chen, 2001)
- Family norms: patriarchal structures and gender division of labour within the household (c.f. Heintz and Pollin, 2003)
- Economic restructuring: globalisation, shifts from public to private sectors, shifts from agriculture to non-agriculture (c.f. Lastarria-Cornhiel, 2006; Chen, Vanek, Lund and Heintz, 2005).

In most countries, the proportion of informal employment is much greater in the agricultural sector than in the non-agricultural sectors. As the share of the agricultural sector in the economies of developing countries started to decline in the 1970s, and since men have been leaving agriculture for better-paying work in other sectors, the involvement of women in agricultural activities has been rising. Many countries have experienced a “feminisation of agriculture” in recent decades where women are over-represented in farming activities. In many developing countries, work in agriculture is the most common form of female labour market participation and the largest source of income for women (c.f. Lastarria-Cornhiel, 2006; Esim and Kuttab, 2002; Agarwal, 2003; Heyzer, 2006). However, in developing countries, almost all female activities in agriculture can be considered to be informal (c.f. Lastarria-Cornhiel, 2006; Esim and Kuttab, 2002; Unni and Rani, 2000).

For many women, unregistered subsistence farming is a survival strategy; the informal character of their work is in most cases involuntary, largely because they are given no choice (c.f. UN, 2005). In many developing countries, women's informal subsistence farming is still seen as a woman's obligation to the family, which results from women's lack of control over agricultural resources (c.f. Rebouché, 2006). The patriarchal nature of most rural societies does not provide women with the same rights to land as it does men. In most Muslim countries for example, inheritance laws and governmental land-grant programs are favouring men (c.f. Lastarria-Cornhiel, 2006; Agarwal, 2003). In Kenya, women are still denied the property rights to land upon divorce or separation from their husbands or even following the death of their husbands (c.f. Rebouché, 2006). Even when women do own land, male family members often take control over it. However, even in some further developed countries, women rely on informal subsistence farming. In some of the former Communist countries in Central and Eastern Europe, as for example in Romania, the introduction of the market economy in the 1990s has sharply decreased the options for women in formal employment and pushed women into informal subsistence farming (cf. Esim, 2001; OECD, 2008).

In addition, differences exist in terms of the activities women perform in agriculture, compared to men. Women largely work to contribute to their family's income, whereas men in informal agricultural activities tend to work as self-employed farmers: In developing countries, on average 69,1 % of women work as contributing family workers against 30,9% of men, whereas 71% of men are self employed in informal work in agriculture against 29% of women (c.f. OECD, 2008). Moreover, women tend to work in subsistence farming and in smallholder production, in traditional agro-export agriculture (crops grown on plantations such as coffee, sugar or cocoa) and in the labour intensive field of non-traditional agro-export agriculture (horticulture crops such as vegetables, flowers, fruits), whereas men in agriculture tend to work in machinery-driven, large-scale production of non-traditional agricultural exports (non-food items) and tend to be involved in supervision and management (c.f. Lastarria-Cornhiel, 2006; Chen, 2001). Consequently, informal work in agriculture is characterised by strong gender-based differences in status and income when compared to informal work in the non-agricultural sectors. Women's informal work in agriculture is often low paid, non-paid or in paid in food rather than wage (c.f. OECD, 2008; Rebouché, 2006). Esim and Kuttab (2002) show that in West Bank and Gaza, women in agriculture still are mainly in unpaid family labour, whereas women's informal activities in non-agriculture are mainly remunerated.

This limited data availability leads to serious measurement problems, biasing the estimation results in three possible ways:

- Economic growth may increase informal female economic activities. But as this will not be sufficiently recorded, the positive impact of growth on female labour market participation may be underestimated.
- As economic growth may bring greater access to the formal labour market, growth may substitute unrecorded female labour with recorded female labour in the formal sectors. The measured female labour market participation would then increase, though women's work intensity has not increased. The positive impact of growth on female labour market participation may then be overestimated. Furthermore, economic growth may substitute unrecorded housework and caring activities with recorded female labour: Since home production and housework is not accounted in the national accounts, women's labour now becomes visible and the positive impact of growth on female labour market participation will be overestimated (accounting effects).
- Economic growth may inversely substitute recorded female activities for non-recorded activities (process of "informalisation" of female work). This would lead to an overestimation of the negative impact of growth on female labour market participation.

Furthermore, measures of female labour market participation are often not comparable across countries as definitions and measurement concepts of women's labour market participation differ (c.f. Bardhan and Klasen, 1999; Forbes, 2000). In addition, measurements disaggregated by gender are often incomplete and inconsistent in terms of time. As Goldin (1995) emphasises, there are few consistent data series on employment by gender, especially for developing countries. This goes particularly for specific measures of female labour market participation such as female labour market participation divided by sector, by age group, by qualification, by family status, by work time etc. Consequently, estimations based on a large group of countries and several time periods have to focus on very general measures of female labour market participation. Moreover, the lack of access to specific data in the field of gender and labour markets means that significant exogenous variables (such as family policies for example) can not be included in the estimation equation, which bears the risk of generating omitted variable bias. Hence, the problematic statistical and conceptual practices lead to a gender bias in official statistics and concepts of female labour market participation. Findings of the impact of growth on female labour market participation may

therefore bias the true relationship. As the quality of the results can only be as good as the quality of the available date, the regression results must be interpreted with care.

#### 2.2.4. Estimation problems

##### *Endogeneity*

It is likely that in the cross country analysis, Cagatay and Özler (1995) insufficiently solve the problem of endogeneity, which exists due to the feedback effects between GNP per capita and the female share of the labour force. Cagatay and Özler (1995) estimate the impact of  $\ln GNP$  on the female share of the labour force participation ( $FLF$ ), based on the following simplified estimation model:

$$FLF_i = \beta_1 + \beta_2 \ln GNP_i + \beta_3 (\ln GNP_i)^2 + \varepsilon_i \quad (10.1.)$$

The estimation model describes the conditional expectation of the best linear approximation of  $FLF_i$  given  $\ln GNP_i$  and  $(\ln GNP_i)^2$ . There is no possible interpretation of the model unless assumptions are made about the error term  $\varepsilon_i$ . The error term includes all unobservable factors that affect the female share of the labour force. The required assumption is that the exogenous variables  $\ln GNP$  and  $(\ln GNP)^2$  are not correlated with the error term. Only in this case the OLS estimators are consistent.

Yet it is likely that this condition does not hold for the estimation model of Cagatay and Özler (1995). The discussed empirical analysis by Klasen (1999) showed that a country's income growth promotes female labour market participation. The two-way causality between the endogenous and exogenous variables suggests that the exogenous variables  $\ln GNP$  and  $(\ln GNP)^2$  are actually endogenous. This endogeneity problem leads to the fact that the exogenous variables  $\ln GNP$  and  $(\ln GNP)^2$  are correlated with the error term in the regression model:

$$\text{Cov}(\varepsilon_i, \ln GNP_i) \neq 0 \quad (10.2)$$

$$\text{Cov}(\varepsilon_i, (\ln GNP_i)^2) \neq 0 \quad (10.3)$$

Consequently, the OLS estimation method produces regression coefficients of  $\ln GNP$  and  $(\ln GNP)^2$  that are biased and inconsistent.

### *Multicollinearity*

Multicollinearity means that exogenous variables are correlated with one another. This could be the case for  $\ln GNP$  and the share of urban population  $URB$ , for example.

$$\text{Cov}(\ln GNP_i, URB) \neq 0 \quad (10.4)$$

With multicollinearity, it is difficult to interpret the regression coefficients. This is because the coefficients show how much the endogenous variable changes when changing the exogenous variable, given that all the other exogenous variables stay constant. If the exogenous variables are correlated, it is not possible to change one exogenous variable while keeping the other exogenous variables constant. The estimation method then is not able to ascribe the change of the endogenous variable to a certain determinant. Large standard errors of the concerned exogenous coefficients point to multicollinearity. Furthermore, the increased variance of the OLS-estimator leads to smaller t-statistics. As the exogenous variable  $(\ln GNP)^2$  is a function of the exogenous variable  $\ln GDNP$ , there exists perfect multicollinearity between the two variables. Consequently, the estimated coefficients of the two variables can not be interpreted separately.<sup>16</sup> In any case, multicollinearity does not reduce the predictive power or reliability of the estimation model as a whole.

### *Non-stationarity*

The data used by Cagatay and Özler (1995) contains pooled observations for two time periods (1985 and 1990) and the observations for the female share of the labour force as well as the observations for all the exogenous variables including  $\ln GNP$  vary over time. Non-stationarity appears if a determinant's observations over time are marked with a trend, meaning that one observation of the process is correlated with previous values of the same process. Figuratively speaking, this means that the data "keep their own past in memory": This is the case if, for example, after a boom period the GNP does not entirely fall back on its original level. The observations over time of GNP would then be non-stationary. It could also be that, in this context, a strong growth of a country's GNP (boom period) leads to a rise in the female share of the labour force, but when the GNP falls back to its normal level, the female labour market participation does not fall back to its starting point but stays on a higher level. If this is the case, the observations over time also would suffer from non-stationarity. In these cases, the OLS-estimators would be unbiased, but inefficient. This means that the standard errors and the t-values would not be estimated correctly.

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<sup>16</sup> See chapter 2, section 3.1., for detailed information about the interpretation of the two coefficients (mathematical explanation).

### **2.3. Conclusion**

The presented literature overview does not offer a clear answer to the question how growth affects the female labour market participation.

On the theoretical side, there exist two different approaches. Whereas the arguments of the “modernisation neoclassical approach” suggest a positive impact of growth on female labour market participation, the “feminisation U” theory provides arguments that suggest a convex impact.

On the empirical side, the results are ambiguous, either. Descriptive time series studies for single countries as well as recent empirical work based on cross-country data assume a “feminisation-U”. However, the time series studies do not offer precise results because of data weakness caused by measurement problems and limited data availability. Serious measurement problems concerning very early observations of the nineteenth and the beginning of the twentieth century weaken the tenability of evidence. The findings of the presented empirical cross-country studies are also unclear. Goldin's (1994) cross country study does not yield precise results to validate the “feminisation U” hypothesis, because she does not present an all-in-one estimation model, and hence, it is not possible to ascertain a convex relationship between growth and female labour market participation. Cagatay and Özler's (1995) cross country study contains an all-in-one estimation model, which includes not only income determinants, also other macro-level determinants such as structural adjustment policies (SAP) that are supposed to influence female labour market participation. Nevertheless, the empirical results provide contradictory findings, supposing a concave instead of a convex impact of growth on female employment, even though Cagatay and Özler (1995) do not consider their estimation results a rejection of the “feminisation U” hypothesis. However, the detailed discussion of the applied estimation methods and the linked methodological problems proposed in this section shows that it would be premature to generally reject the “feminisation U” hypothesis because of the contradictory findings of Cagatay and Özler (1995). It becomes clear that problems caused by endogeneity, in particular, merit more consideration, because the inverse causality between growth and female labour market participation risks significantly biasing the estimation results. Furthermore, non-stationarity problems need more consideration, because estimators risk being inefficient.

So far, the overview of today's empirical evidence on the impact of growth on female labour market participation has shown that the “feminisation U” hypothesis has not been clearly

proven empirically. Nevertheless, what we can say so far is that the unclear estimation results do not speak in favour of the validity of the “modernisation neoclassical approach”, either. The lack of clear empirical findings represents a research gap. Closing this research gap is necessary, because the validity of the “feminisation U” hypothesis would imply that, to promote gender equality in the labour market, it is not sufficient to rely solely on the positive effects of maturing growth, but gender promoting institutions and policies are necessary. In order to close the research gap, it is necessary to empirically test the “feminisation U” hypothesis by applying further empirical methods that specially address endogeneity problems. This is possible by using a large macro panel data set (combination of time-series and cross-country data), because the structure of panel data allows using System-GMM estimation and lagged variables as instrumental variables (2SLS). These techniques raise the probability of obtaining unbiased and efficient estimation results. Chapter 2 suggests an empirical estimation of the impact of growth on female labour market participation based on a large panel data set including observations of over 180 countries that span over four decades.

**Chapter II:**

***The impact of macroeconomic growth on women's labour market participation: Do panel data confirm the “feminisation U” hypothesis?***

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## 1. Introduction

In this chapter, I present an empirical investigation on the impact of growth on female labour market participation based on macroeconomic panel data (combination of cross-country and time-series data).

Due to the recent, more sophisticated empirical analyses presented in chapter I, the research community today unanimously recognises that women's empowerment, and more precisely women's participation in the labour market, positively impacts a country's economic growth. Economic theory and empirical analysis give clear evidence for this positive impact, as shown in chapter 1. On the theoretical side, taking into account the accumulation of human capital in endogenous growth models was a first step towards these findings (c.f. Barro and Sala-i-Martin, 1995). Knowles, Lorgelly and Owen (2002) theoretically show that equalising the gender distribution of human capital has a positive impact on growth. Galor und Weil (1996) argue that the rise of women's labour market participation increases growth. Several recent empirical studies support the theoretical arguments: Klasen (2002) finds a significant positive impact of the level of female education (measured by the female-male ratio of total years of schooling of the people aged 15 and over) on growth. Furthermore, Klasen (1999) finds that women's labour market participation impacts positively on economic growth.

The inverse impact of growth on the economic status of women, and more precisely on female labour market participation, is much less researched. The theoretical discussion maintains several contradictory arguments. Whereas the “modernisation neoclassical approach”, based on Becker (1957) suggests a positive impact of growth on female labour market participation, the “feminisation U” hypothesis, based on Boserup (1970), suggests that growth convexly influences the female labour market participation: At first, growth lowers female labour market participation relative to male labour market participation and then increases it in the long run. Most of the empirical analysis, for example by Goldin (1994) and by Cagatay and Özler (1995), assume the “feminisation U” hypothesis, but do not prove the universal validity of a convex impact of growth on female labour market participation. The hitherto existing empirical estimations are based on pooled cross country data. The limited

time periods of these data as well as estimation problems lead to imprecise and contradictory findings.

The deficient empirical evidence of the impact of growth on female labour market participation represents an essential research gap. Answering the question if growth unambiguously promotes female labour market participation or if growth inconclusively impacts female labour market participation is of scientific and of political interest. Policy-makers risk assuming that growth promoting policies automatically encourages female labour market participation. Consequently, they tend to renounce implementing special policies to empower women's status on the labour market. Yet, if policy makers wrongly assume that they can trust the equalising effects of growth, female labour market participation will be less than its potential level. This leads to high economic costs not only for women, but for society as a whole, because gender-specific employment differences lower a country's growth performance and therefore reduce aggregate welfare. Empirical evidence for the "feminisation U" hypothesis, which assumes that the impact of growth on women's labour market activities is not strictly positive, would suggest that an explicit enhancement of women's economic opportunities is advisable in order to increase a country's long term economic potential.

Today, newly available data allows empirically testing the "feminisation U" hypothesis based on a large macro panel data set. I refer to "panel data" when talking about the combination of cross-country and time-series data. I test the "feminisation U" hypothesis based on panel data including observations of 184 countries from 1965 to 2004.

Because panel data sets are typically larger than cross-sectional or time-series data sets, and explanatory variables vary over two dimensions (individuals and time), estimators based on panel data are quite often more accurate and more efficient. More precisely, the availability of panel data allows for two main improvements in comparison to the cross country studies by Goldin (1994) and Cagatay and Özler (1995): Firstly, the larger data set provides the opportunity to test for the robustness of the empirical findings by using different specifications for female labour market participation. Secondly, the longer time period provides the opportunity to better control for possible endogeneity problems by introducing lags -or more general deviations- of the exogenous variables as instrumental variables. This procedure limits the risk of obtaining biased estimation coefficients caused by inverse causality.

To address endogeneity problems I use specifically prepared data and several econometric methods for dynamic panel data. The econometric analysis, based on OLS-, FE-, IV- and System-GMM estimations, globally confirms the “feminisation U” hypothesis, but suggests that the U-curve is more dominated by between-country variation than by within-country variation.

The following section presents the empirical model, the econometric specifications and the database I have chosen for my analysis. The estimation results are shown in a second step. Subsequently, I present additional techniques of data analysis: a detailed cluster analysis of the data, an econometric method dealing with time-specific effects and the concept of Granger causality.

## **2. Econometric specifications and the database**

### **2.1. The empirical model**

The empirical investigation analyses the impact of the gross domestic product (GDP) per capita on female labour market participation. The main novelty of this paper is that the estimated models are built on two-dimensional panel data (combined cross-sectional and time series data), which allows to control for endogeneity. Consequently, estimators are more accurate and more efficient in comparison to cross country studies

The results will show whether the “feminisation U” hypothesis, which suggests that growth first lowers female labour market participation and then increases it from higher levels of economic development on, can be confirmed empirically. In other words, it will be shown whether female labour market participation is a square function of the natural logarithm of gross domestic product (GDP) per capita.

The basic model is:

$$FemaleLabourMarketParticipation_{it} = \beta_1 + \beta_2 \ln GDP_{it} + \beta_3 (\ln GDP_{it})^2 + \varepsilon_{it} \quad (11.1)$$

$\beta_1$  represents the constant term,  $\ln GDP$  the log of GDP per capita and  $(\ln GDP)^2$  the square of  $\ln GDP$ , capturing the “feminisation U”, and  $\varepsilon$  represents the random error term distributed normally with mean zero.

To confirm the “feminisation U” hypothesis, the coefficient  $\beta_3$  must be significantly positive as an indicator of the curve’s convexity, which implies that there exists a minimum point in the data plot (second derivation of equ. (1)  $> 0 \rightarrow$  minimum point).

A wider model includes other possible determinants of female labour market participation and controls for country- and time-specific effects:

$$\begin{aligned} FemaleLabourMarketParticipation_{it} = \\ \beta_1 + \beta_2 \ln GDP_{it} + \beta_3 (\ln GDP_{it})^2 + \beta_4 FERT_{it} + \beta_5 EDU_{it} + \beta_6 OECD \\ + \beta_7 LA + \beta_8 EA + \beta_9 SSA + \beta_{10} MENA + \beta_{11} DV1960s + \beta_{12} DV1970s \\ + \beta_{13} DV1980s + \beta_{14} DV1990s + \beta_{15} MUSLIM + \varepsilon_{it} \end{aligned} \quad (11.2)$$

with:

- FERT*: Fertility rate
- EDU*: Percentage of women of the population aged 15 and over who have successfully completed secondary schooling.
- OECD*: Dummy OECD countries
- LA*: Dummy Latin America
- EA*: Dummy East Asia
- SSA*: Dummy Sub-Saharan Africa
- MENA*: Dummy Middle East and North Africa
- MUSLIM*: Dummy for countries with a Muslim population  $\geq 0,5$
- DV1960s, DV1970s, DV1980s, DV1990s*: Time specific dummy variables

Including fertility and the educational attainment of women in the model captures some of the indirect effects of *GDP* on the female labour market participation. The theoretical analysis in the previous chapter has shown that there is a series of other explanatory variables that could be included in the estimation model, like the share of the agricultural sector, the degree of urbanisation, the average years of male education, the average male and female income, equalising institutions etc. Yet, as these variables are not available for all countries and all periods, I do not include them in the estimation model in order to maintain a high number of observations. Moreover, I capture exogenous variables that are constant over time by fixed effects.

## **2.2. The endogenous variable: women's labour market participation**

Female labour market participation is the best available indicator for the economic role of women when the purpose is to take into consideration several decades and over 150 countries. Surely it would be interesting to measure the impact of growth on economic empowerment of women and not only on their labour market participation. Examining the real economic role of women would not only entail measuring female labour market participation, but also taking into account women's working hours (full time, part time), women's qualification and income, their detailed working conditions (precarity, degree of social security) and their part of decision making in the economy, in politics and society, for example.

However, the limited data availability makes it impossible to include all this information in the estimation model. Firstly, it is not possible to create an "female empowerment index" for all 184 countries and four decades, because available data are fragmentary. Missing observations, especially for development countries and early time periods, would bias the estimation results to a great extent. Secondly, creating an indicator for the empowerment of women based on several variables weakens the overall view and the transparency of the estimation results. Nevertheless, there exist several wider measures of female empowerment today. The United Nations Development Program, for example, offers a Gender Related Development Index (GDI), which represents a gender specific Human Development Index (HDI)<sup>17</sup> that tries to capture women's well being. The GDI takes into account women's life expectancy, education and income and penalises gender disparities in these fields. The GDI index is available for a large set of countries, but for a large set of countries the database contains observations only from 2006 on, and therefore the data can not be used in the panel data framework. The same problem applies also to another existing index which is the GEM (gender empowerment measure), a composite indicator that captures gender inequality in political participation and decision-making (women's and men's percentage shares of parliamentary seats), economic participation and decision-making power (women's and men's percentage shares of positions as legislators, senior officials and managers and women's and men's percentage shares of professional and technical positions) and power over economic resources (women's and men's estimated earned income in PPP US\$). Hence, in order to keep the panel data framework it is advisable to concentrate on the female labour market participation as indicator of the economic role of women.

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<sup>17</sup> For more information on the HDI, see next section.

Nevertheless, even simple measures of female labour market participation are confronted with serious measurement problems. Data weakness arises because female work is often informal and therefore unrecorded. In developing countries, the major part of women works informally in the agricultural and in the black market sector (c.f. Chen et al. 1999). In addition, non-paid work, domestic and family-related activities and self-employed work are rarely included in the statistics (c.f. Waring, 1988; Klasen, 2002). The UNDP (1995) shows that 66% of the female activities in developing countries are not captured by national accounts, compared to only 24% of male activities.

It would also be useful to differentiate the female labour market participation by employment status, by sector, by working hours, by age or by the presence and number of children, and to separate female labour market participation into wage workers, unpaid family workers and self-employed workers. But there are large inconsistencies in the definition of specific labour market participation measurements across the world. Taking into account differentiated measures of female labour market participation would imply reducing the observations to developed countries of the Western World.<sup>18</sup> Moreover, even data on general female labour market participation has to be handled with care, because the measurement methods and definitions can differ in quality and coverage between countries and data sources. Differences in statistical and conceptual practices lead to a gender bias in official statistics and concepts of labour market participation (c.f. Bardhan and Klasen, 1999). Hence, even when focusing on female labour market participation only, empirical findings can be biased due to measurement problems and the regression results must be interpreted with care.

In view of these measurement problems, I use three alternative empirical specifications for female labour market participation to test the robustness of the findings (sensitivity analysis):

- *FLF*: The female labour force in percentage of the total labour force. As the total labour force includes both men and women, measurements of the female labour force take into account the level of the male labour force.
- *FAR*: The female activity rate as share of female formal sector employees in the female working age population (in percentage points). This measurement does not account for the male activity rate.
- *RAR*: The ratio female activity rate / male activity rate

Table 10 in the appendix gives an overview of the data used in this paper. The following sections describe the endogenous variables in detail.

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<sup>18</sup> See chapter 3 for a more specific analysis of female employment patterns in EU countries.

### *Female Share of the Labour Force (FLF)*

The female share of the labour force shows the extent to which women are active in the labour force. It is defined as the percentage of women in the total labour force, where the total labour force comprises men and women aged 15 and older who meet the ILO definition of the economically active population. It includes employed and self-employed workers as well as unemployed workers and first-time job-seekers. Furthermore, labour force measures generally include the paid workers in the agricultural sector, armed forces and seasonal or part-time workers. Yet it excludes homemakers, unpaid caregivers and workers in informal sectors (c.f. Morrisson and Jütting, 2005).

Data on the female share of the labour force are drawn from the World Bank's World Development Index Data Base (2006) and cover the years 1980 to 2004 for 186 countries. The 4668 observations are distributed quite evenly across years and across countries. Early observations and observations of developing countries are adequately represented.

The female share of the labour force as percentage of the total labour force varies between 5,05% and 54,04% with a mean of 38, 70% over all countries and all years (see table 10).<sup>19</sup> In 1980, the United Arab Emirates had the lowest female share of the labour force with 5,05%, and Cambodia had the highest with 53,23%. In 2004, West Bank and Gaza had the lowest female share of the labour force with 13,10% and Mozambique had the highest with 53,52%. The mean rose from 37,14% in 1980 to 40,24% in 2004, which shows that the range of the variable does not change very much over the 24 years.

Regarding only OECD countries, the values vary between 25,13% and 48,02%, with a mean of 41,29% over all years. In 1980, Ireland had the lowest female labour force with 27,96%, and the Czech Republic had the highest with 47,14%.<sup>20</sup> In 2004, Turkey had the lowest female share of the labour force with 26,43% and Finland had the highest with 43,64%. The mean of the female share of the labour force for all OECD countries rose from 38,90% in 1980 to 43% in 2004. Hence, the range of the variable does not change very much over the 24 years in OECD countries, either.

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<sup>19</sup> The male share of the labour force varies between 45,96% and 94,95% with a mean of 61,35%.

<sup>20</sup> Counting Mexico with a rate of 27,54% in 1980 as a country of Latin America and not of the OECD.

### *Female Activity Rate (FAR)*

The female activity rate is defined as the share of female formal sector employees in the female working age population aged 15 and over (in percentage points). Data on the female activity rate are drawn from the ILO Laboursta Data Base (2007) and cover the years 1960 to 2005 for 171 countries. In comparison with the female share of the labour force (*FLF*), the time horizon concerning *FAR*-observations is almost twice as long, but instead of 4668 observations for the *FLF* there are only 1453 observations for the *FAR*. The observations are irregularly distributed over time; there are much fewer observations for the 1960s and 1970s than from 1980 on. Moreover, Sub-Saharan Africa countries are strongly underrepresented.

The female activity rate as a percentage of the female working age population varies between 2,50% and 93,10% with a mean of 42,19% over all countries and all years (see table 10).<sup>21</sup> In 1960, Egypt had the lowest female activity rate with 5,20%, and Thailand had the highest with 81,40%. In 2005, Tunisia had the lowest female activity rate with 24,40% and Ethiopia had the highest with 78,80%. The mean rose from 32,53% in 1960 to 49,00% in 2005. The range of the variable changes much more in comparison to the female share of the labour force because of the longer time period.

Regarding only OECD countries, the values vary between 17,00% and 74,20%, with a mean of 45,47% over all years. In 1960, Portugal had the lowest female activity rate (17,00%), and Turkey had the highest (65,40%). Turkey's female activity rate had constantly fallen over the whole sample period and in 2005, Turkey denotes the lowest female activity rate in the OECD (24,8%). Denmark is on top of the list with 73,90%.<sup>22</sup> The mean of the female activity rate for all OECD countries rose considerably from 35,59% in 1960 to 50,8% in 2005.

When interpreting data on female labour market participation, one has to distinguish between the female share of the labour force (*FLF*) and the female activity rate (*FAR*). These two indices of female labour market participation cannot be compared to each other. As the female share of the labour force (*FLF*) measures the share of women in the *total* labour force, its mean (38,65%) is naturally lower than that of the female activity rate (42,13%), which measures the share of working women in the *female* working age population.

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<sup>21</sup> The male activity rate a percentage of the male working age population varies between 51,20% and 97,00% with a mean of 77,00%.

<sup>22</sup> Turkey's total activity rate also fell, from 79,70% in 1960 to 48,30% in 2005. Turkey's ratio female/male activity rate fell from 0,70 in 1960 to 0,34 in 2005.

### *Ratio female activity rate /male activity rate (RAR)*

Data on the ratio of the female to the male activity rate are also drawn from the ILO Laboursta Data Base (2007) and include the years 1960 to 2005 for 171 countries. Like observations of the *FAR*, observations of the *RAR* cover a much longer time horizon than observations of the *FLF*, but there are also only 1453 observations. The observations are irregularly distributed over time and there are again much fewer observations in the 1960s and 1970s than from 1980 on and Sub-Saharan Africa countries are strongly underrepresented.

The ratio female/male activity rates varies between 0,30 and 1,08 with a mean of 0,56 over all countries and all years (see table 10). In 1960, Egypt had the lowest ratio (0,06) and Thailand had the highest with 0,91. In 2005, Turkey had the lowest ratio with 0,34 and Denmark had the highest with 0,68. The mean grew from 0,38 in 1960 to 0,68 in 2005.

Regarding only OECD countries, the observations vary between 0,19 and 0,90 with a mean of 0,63 over all years. In 1960, Portugal had the lowest ratio (0,19), and Turkey had the highest (0,70). In 2005 Turkey had the lowest ratio (0,34) and Denmark had the highest (0,90). The mean of the ratio for all OECD countries rose from 0,41 in 1960 to 0,73 in 2005.

### **2.3. The exogenous variable: macroeconomic growth**

I do not use growth rates of GDP, but levels of GDP per capita as exogenous variable. This procedure is advised in macroeconomic analysis in order to avoid the kind of estimation bias that Barro and Sala-i-Martin (1995), for example, are confronted with when estimating the impact of female education on growth. Chapter 1 shows that Barro and Sala-i-Martin (1995) falsely find a negative impact of female education on growth, mainly because they use GDP growth rates instead of GDP levels as endogenous variables. We know from Solow (1956) that the higher the GDP levels of a country are, the lower are the yearly GDP growth rates (convergence mechanism). Hence, as poor countries have higher gender differences in education than countries with high levels of GDP, Barro and Sala-i-Martin's estimation model falsely interpret low female education as growth promoting.

In order to capture proportional rather than absolute differences in the distribution of GDP levels, I use the natural logarithm of GDP per capita (*InGDP*), which is standard in most macro-econometric works as seen in chapter I. The natural logarithm of GDP does not

represent the growth rate of GDP. Only the difference of the natural logarithm ( $\ln GDP_t - \ln GDP_{t-1}$ ) would approximate the year to year relative changes in GDP ( $(GDP_t - GDP_{t-1}) / GDP_{t-1}$ ). The natural logarithm reduces absolute increases in the GDP levels.

GDP observations are the countries' yearly GDP per capita (in constant 2000 US\$). The gross domestic product per capita at purchaser prices is defined as the sum of the gross value added by all resident producers in the economy, plus any product taxes, less any subsidies not included in the value of the products, divided by the number of inhabitants.<sup>23</sup> It is calculated without deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.

Data on GDP per capita (in constant 2000 US\$) are drawn from the World Bank's World Development Index Data Base (2006). The data covers the years 1965 to 2004 for 184 countries. The 5966 observations of  $\ln GDP$  range from 4,03 to 10,88 (see table 10), implying that yearly GDP per capita varies between 56,52 US\$ and 52.943,34 US\$ with a mean of 5.179,46 US\$. The observations are distributed quite evenly over the years and over the countries.

Just as female labour market participation insufficiently represents women's empowerment, GDP per capita insufficiently represents a nation's welfare, not to mention a nation's well-being or standard of living. First of all, measures of GDP discount the non-monetary economy and hence do not consider unpaid productive activities like voluntary work, domestic work and subsistence production. The evaluation and measurement of women's housework is a difficult task, because housework, raising children and caring for family members is viewed as the opposite of market work and hence is not assigned an economic value. Only in a few countries, mainly in industrialised countries like Germany for example, there exist estimations of the equivalent value of housework (for Germany: time budget studies by the German Federal Statistical Office, available for the years 1991 and 2001). Would all men and women dedicate equally many hours to housework and caring, it would suffice to measure GDP to capture differences in economic development across countries. As this is not the case, GDP is not an ideal measure of economic activity. Furthermore, GDP measures leave aside black market activities. These unaccounted activities bias income measures downward. Another consequence arising from these unrecorded activities is that GDP increases when non market production becomes marketable. This market shift biases measures of GDP upwards, for example when meals or other products that used to be made

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<sup>23</sup> Definition used by World Bank, OECD and UN.

at home are now sold at the market as semi-finished or finished products. Moreover, GDP as an indicator of a nation's welfare is often criticised because it only reflects average national income, but does not indicate income distribution or expenditure patterns. GDP also ignores the quality of goods (durability) and negative externalities of growth such as the damage to the environment. As GDP assumes that if there were more goods in circulation, general welfare would automatically increase, GDP growth does not account for sustainability. Nobel Prize winner Joseph E. Stiglitz, for example, sees GDP as an imperfect indicator of a nation's welfare because improvements in the quality of life, which do not show up in material consumption, do not increase GDP.

In order to take into account other determinants of well being, various kinds of "quality of life" indices have been developed recently. The most influential indicator is the Human Development Index (HDI), which was introduced by the United Nations Development Program in its annual Human Development Report in 1995. Ideas of Nobel Prize winner Amartya Sen were influential in the development of this indicator. The HDI combines normalised measures of life expectancy, knowledge (literacy and educational attainment) and living standard (GDP per capita in PPP US\$). The use of the Purchasing Power Parity (PPP) takes into account the countries' different price levels and converts the data into a common currency. The PPP can be a better indicator of living standards, especially of less-developed countries, because it compensates for the weakness of local currencies in world markets. A comparison of a country's GDP and HDI can reveal a country's policy choices. For example, Oman is a country with a relatively high GDP per capita, but has a relatively low HDI due to its relatively low level of average educational attainment. (c.f. UNDP, 1995). Yet, as even the HDI's information value is limited, further research is made in the field of measuring "quality of life", or even "happiness", which is assumed to correspond to the freedom to make personal choices. In 2007, French President Nicolas Sarkozy appointed Joseph E. Stiglitz to head a commission to find a new method of economic calculation that will include quality-of-life factors such as personal freedom, livelihood, compassion and sharing and that will make more room for moral and ethical values, including social and environmental concerns.<sup>24</sup>

Today, the new indices are becoming a tool for judging the true wealth of nations, but due to limited data availability they rather enhance than replace GDP as a measure of a country's well-being. The HDI is available from 1975 on, but not before 1975. In order to keep the data set large (with early observations from the 1960s on and from over 180 countries), I concentrate on GDP per capita as indicator for economic development, which is still the

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<sup>24</sup> Commission on the Measurement of Economic Performance and Social Progress (chair: Joseph E. Stiglitz, chair adviser: Amartya Sen, coordinator: Jean-Paul Fitoussi, OFCE and IEP Paris)

standard measure of welfare in economics. The major advantages to using GDP per capita as an indicator of standard of living are that it is measured frequently and widely. Furthermore, the technical definitions used within GDP are relatively consistent between countries. In addition, my empirical investigation of the “feminisation U” hypothesis, based on panel data, is directly linked to the cross country studies by Goldin (1994) and Cagatay and Özler (1995) discussed in the previous chapter, which use income levels instead of more complex welfare measures as growth indicators. Hence, my adherence to GDP per capita is mainly due to superior comparability of research results.

## **2.4. Additional exogenous variables**

Contrary to Goldin (1994) and to Cagatay and Özler (1995), I use a large age group of women participating in the labour market in order to keep the data set large (with early observations from the 1960s on and from over 180 countries). All measures of female labour market participation contain women aged 15 and older. However, the large age group contains young women whose fertility decisions impact their labour market participation decisions. Furthermore, the age group contains women whose changes in education impact their labour market participation decisions. Hence, fertility rates (*FERT*) and educational levels (*EDU*) are included as exogenous variables in part of the regressions in order to filter out their impacts on female labour market participation.

### *Fertility (FERT)*

Data on fertility are drawn from the World Bank's World Development Index Data Base (2006) and include observations for 197 countries over the years 1960 to 2004. The 4629 observations range from 0,84 to 8,50 (children per women) with a mean of 3,63 (see table 10). The observations are distributed quite constantly over the years and over the countries.

### *Educational Attainment (EDU)*

Data on the educational attainment of the female population are drawn from Barro and Lee (2000) and refer to the percentage of women of the population aged 15 and over who have successfully completed secondary schooling (at least). The over-15 age group corresponds better to the labour force for many developing countries as the over-25 age group that also can be drawn from Barro and Lee (2000). The percentage of the population that has

successfully completed secondary schooling is a way to show the population's attainment of skills and knowledge associated with this level of education (c.f. Klasen, 2002).

The data set provides estimates for 120 countries at five-year intervals for the years 1950-2000. The 955 observations vary between 0,10 and 50,80 with a mean of 7,54 (see table 10). The observations are distributed quite evenly across the years and the countries. Taking this educational variable into account may improve the fit of the model, but its number of observations is very low in comparison to the numbers of observations of the endogenous variables and the other exogenous variables. This is why the OLS-estimation based on the multivariate model (2) is carried out twice, with and without *EDU*, in order to see whether the results change fundamentally due to missing observations.

## 2.6. Correlation patterns

The relationship between the female share of the labour force (*FLF*) and economic development based on the available panel data can be seen in figure 8, which scatters the female share of the labour force against *InGDP* per capita.

**Figure 8: Female share of the labour force (FLF) against InGDP**



Source: own calculations

Figure 8 already suggests a U-shaped relationship between the two variables.<sup>25</sup> On the left upper side we find countries that have a high female share of the labour force (sometimes over 50%) and at the same time low GDP per capita levels (sometimes under 200 US\$). These observations are mainly from the 1980s<sup>26</sup> and largely contain Sub-Saharan Africa countries like Burundi, Rwanda, Liberia, Ethiopia, Congo, Mozambique and Malawi. On the right upper side, we find countries that have both a high female share of the labour force (around 42%) and high GDP per capita levels (over 2000 US\$). These observations are mainly from the 1990s and the years 2000-2004 and contain in big parts OECD countries. The lowest points of the figure, observations with a low female share of the labour force (under 25%) and medium-level income (between 1000 and 1500 US\$), are represented mostly by Latin American and North African countries, like Venezuela, Mexico, Ecuador, Morocco, Egypt, Tunisia and Algeria. The observations are mainly from the 1980s.

So far, these observations are in line with the “feminisation U” hypothesis. Observations which are not in line with the hypothesis are the outliers in the bottom-right corner of figure 8. Countries with high GDP levels and low female shares of the labour force at the same time are oil exporting, Muslim countries of the Middle East, like the United Arab Emirates, Saudi Arabia, Qatar or Kuwait. These countries owe their high income levels in big parts to the export of natural resources and obtain a rent which is hardly produced by human capital.

Other observations that do not fit into the U-shaped curve are those in the upper middle within the curve. These are, in parts, observations from the former Eastern Bloc countries and the years 1980 to 1995. Within this period, countries like Slovakia, Hungary or Poland had very high levels of *FLF* relative to their average level of GDP per capita, mainly due to area-wide affordable child care infrastructure.

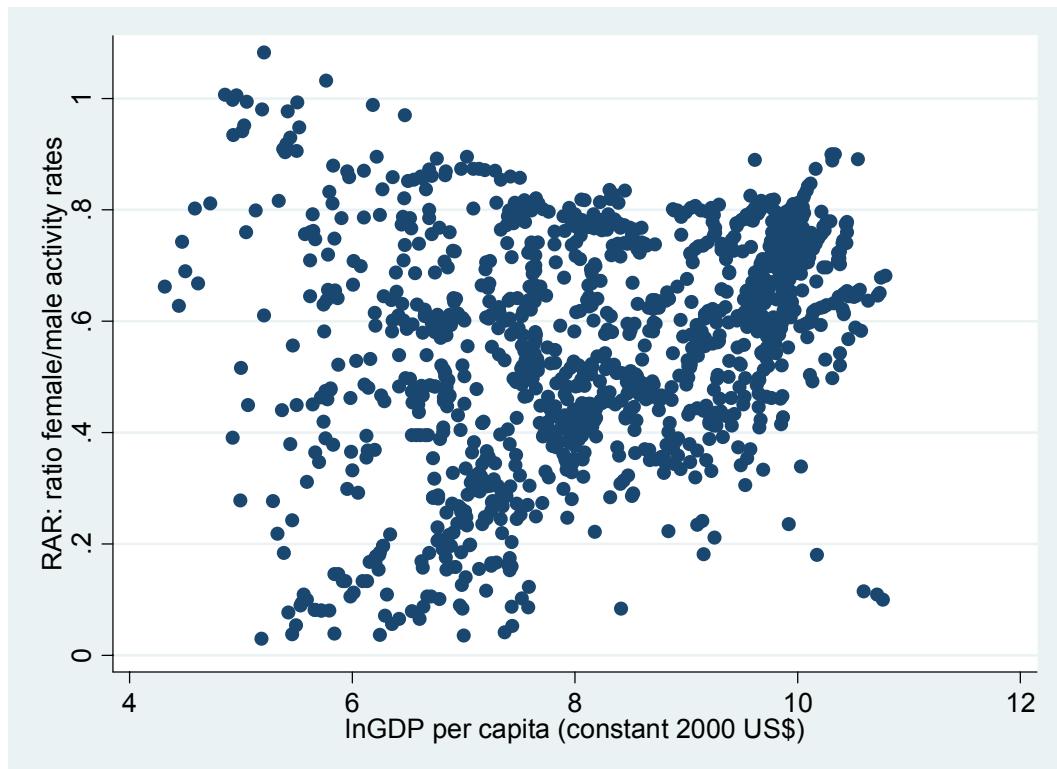
The scatter of the ratio female/male activity rates (*RAR*) against *InGDP* can be seen in figure 9.

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<sup>25</sup> The graph shows between-country variation at first sight, whereas the circles in line are observations from one country (within-country variation).

<sup>26</sup> as data on the *FLF* are not available before 1980.

**Figure 9: The ratio female/male activity rates (RAR) against  $\ln G D P$**



Source: own calculations

Here, the suggestion of the figure is not as clear as in figure 8. As, in comparison to  $FLF$ , measures of  $RAR$  contain observations of the 1960s and 1970s, there are somewhat more observations on the left side (low levels of GDP per capita). The relationship between the female activity rate ( $FAR$ ) and  $\ln G D P$  tells a similar story (not shown here).

## 2.6. The econometric methods

### *Data preparation*

For all estimations methods described below, I do not use the panel data as it is, but I use the data in a prepared form. The data transformation helps to address the problem of possible endogeneity (inverse causality) and therefore lessens the risk of obtaining biased and inconsistent estimators.

I prepare the data the following way: For every country, I use means of 5 years for the observations of the endogenous variables and observations of the beginning year of the respective mean for the exogenous variables. For example, if a country's observation of  $FLF$

is the mean of the years 1980-1984, the corresponding observation of  $\ln GDP$  is from 1980. This implies that I use lagged exogenous variables. This procedure responds to possible endogeneity, because it impedes that  $FLF$  inversely affects  $\ln GDP$ . It is not possible that  $FLF$  observed in 1984 impacts GDP per capita in 1980.

The data preparation procedure provides quinquennial data. In order to avoid inverse causality, I also could simply carry out the estimations based on yearly observations and use one year lags of the exogenous variables. For example, if a country's observation for  $FLF$  would be from 1985, the corresponding observation of  $\ln GDP$  would be from 1984. In fact, I use means of five years for the observations of the endogenous variables because the technical structure of the data is unknown. The data contains mainly yearly observations, but in some countries the data inquiry probably takes place only every five to ten years. The database from Barro and Lee (2000), for example, provides only observations at 5-year-intervals for the educational variable  $EDU$ . Moreover, the partition of the measured time period in five year-sections limits time series variations, because five year-intervals are less likely to be serially correlated than annual data.

The downside of the described procedure of the data preparation is that it reduces the numbers of observations. A comparison of table 10 to table 11 shows that data preparing leads to a reduction in the numbers of observations by 50 to 75% for each variable apart from  $EDU$ .<sup>27</sup> Furthermore, the use of observations of the beginning year of the means for the exogenous variables also entails the risk of losing data. If the observation of the beginning year is missing, all observations belonging to the left hand side (up to 5 observations that build the respective mean) drop out, too. The reduced numbers of observations increases the risk of biased and inconsistent estimates. On the other hand, in a complete case estimation based on unedited data, missing observations of the endogenous variable would reduce the database. Using means for the endogenous variable mitigates the problem caused by missing observations of  $FLF$ ,  $FAR$  and  $RAR$ , which in turn lowers the risk of achieving biased and inconsistent estimates.

As the data contains observations that vary over time, it is possible that the cross sectional time series are marked with a trend. If this is the case, the data would be non-stationary, meaning that the mean and the variance of a variable's observations does change over time. Consequently, the estimated coefficients would be inefficient, because the standard errors and t-values would be estimated too high (spurious regression results). To test for possible non-stationarity, I apply a panel data unit root test that goes back to Levin, Lin and Chu

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<sup>27</sup> Apart from  $EDU$ , as the original database from Barro and Lee (2000) provides only observations at 5-year-intervals.

(2002). Levin, Lin and Chu (2002) assume that the stochastic process of a time series has a “unit root” when the coefficient of the lag is 1, meaning that the actual value of a variable “keeps its past value completely in memory”. If the coefficient is smaller than 1, the memory decreases with the size of the lag (geometric series), meaning that the time series is stationary. The test’s null hypothesis is that each variable’s time series contains a unit root against the alternative that each time series is stationary. The unit root test demands balanced panel data. Therefore I apply the test for a sub-set of the quinquennial data, using only observations of the OECD countries and the years 1980-2000. This seems appropriate since time trends are especially important for homogenous groups of countries. The drawback is that the balanced data have a smaller time dimension (only five periods) than the original data. I do the unit root test for four variables *FLF*, *FAR*, *RAR* and *InGDP*. Table 12 shows the test results. The results reveal that the lagged level of all the four series is negative and significant, indicating that the presence of a unit root is rejected. This means that all four variables are stationary, which implies that it is appropriate to apply standard inference to the estimation results. Nevertheless, it cannot be excluded that the test finds stationary processes because of the small time dimension of the data.

### *OLS-estimation*

Based on the quinquennial data, I start with a pooled OLS regression that measures both between and within-country variation. Pooled OLS results should be regarded with reservation, because the estimated OLS-coefficients may be biased and inconsistent due to omitted variables. This problem can occur if the estimation model omits important exogenous variables that are relevant to explain the levels of female labour market participation. It is very likely that estimation model (1) that contains only *InGDP* and  $(InGDP)^2$  as exogenous variables produces biased OLS-estimates. Estimation model (2) only contains two more exogenous variables, *FERT* and *EDU* and captures further effects by dummy variables. High dummy variable coefficients would indicate that the estimation model does not sufficiently describe the endogenous variable.

### *Fixed Effects-estimation*

The fixed effects model captures only within-country variation and therefore controls for level-differences (between groups of countries of different income levels). Using a fixed effects model for panel data allows the exclusion of variables that vary from country to country but

are constant over time (country specific dummy variables). Therefore, the fixed effects model avoids biased estimation results caused by omitted variables that are constant over time. On the other hand, by introducing country dummies in the estimation equation, which allows the elimination of time constant variables, the fixed effects model can weaken the significance of the estimated coefficients due to a dummy variable trap.

### *Random Effects-estimation*

The random effects model captures both within and between-country variation by assuming that country-specific effects that are constant over time are random factors and that the exogenous variables are uncorrelated with the random effect. If this is the case, unobserved country specific variables that are constant over time are captured by an additional residual and the estimators are unbiased and asymptotically consistent. I carry out a Hausman test in order to see if this assumption is appropriate and in order to choose between the fixed effects and the random effects model.

### *Instrumental Variables Estimator (2SLS)*

To further control for possible endogeneity apart from the data preparation, I use an instrumental variables estimator. For the basic model (1), I use lagged variables of  $\ln GDP$  as instruments for  $\ln GDP$  and lagged variables of  $(\ln GDP)^2$  as instruments for  $(\ln GDP)^2$ . I create the lagged variables again by using the quinquennial data and I perform the IV-regression in two steps (Two Stage Least Squares Estimator).

I start by estimating a reduced form in the first step:

$$\ln \hat{GDP}_{i,t} = \beta_1 + \beta_2 \ln GDP_{i,t-1} + \varepsilon_{i,t} \quad (11.3)$$

which regresses the endogenous regressor  $\ln \hat{GDP}_{i,t}$  over the instrument  $\ln GDP_{i,t-1}$ .

Then I calculate  $\ln \hat{GDP}_{i,t}$  based on the estimated coefficients  $\beta_1$  and  $\beta_2$  and I calculate  $(\ln \hat{GDP}_{i,t})^2$  using  $\ln \hat{GDP}_{i,t}$ .

In the second step, I estimate the female labour market participation (*FLF*, *FAR* and *RAR*) based on  $(\ln G \hat{D} P_{i,t})^2$  and on  $\ln \hat{GDP}_{i,t}$ :

$$FemaleLabourMarketParticipation_{i,t} = \beta_1 + \beta_2 \ln \hat{GDP}_{i,t} + \beta_3 (\ln \hat{GDP}_{i,t})^2 + \varepsilon_{i,t} \quad (11.4)$$

Concerning model (2), which includes other exogenous variables, I use lagged variables of *FERT* as instruments for *FERT* and lagged variables of *EDU* as instruments for *EDU*.

### *System GMM-estimation*

A Generalized Method of Moments (GMM) estimator is a dynamic panel-data estimator, appropriate to capture both between-country and within-country variation. GMM allows omitting unobserved variables that are constant over time and considers possible endogeneity at the same time. The GMM method goes back to Arellano and Bond (1991), who obtained additional instruments by introducing first differences of the endogenous and exogenous variables (difference GMM). The differencing process allows leaving out country specific variables that are constant over time, but it magnifies gaps in panels with missing observations. I use a one step System GMM estimator that makes orthogonal deviations instead of differencing (based on Arellano and Bover, 1995; Blundell and Bond, 1998). Instead of subtracting the previous observation from the current one, it subtracts the average of all future available observations of a variable to minimise data loss. The System GMM combines the level equation and the difference equation as a “system”. Like differencing, making orthogonal deviations reduces the risk that the stochastic processes of the exogenous variables are non-stationary. Furthermore, the System GMM specification differs from the other estimation models by the presence of a lagged endogenous variable (*L.FLF* respectively *L.FAR* respectively *L.RAR*) among the exogenous variables. This allows controlling for the dynamics of adjustment.

### **3. Estimation results**

Model (1), containing only *InGDP* and  $(InGDP)^2$  as exogenous variables<sup>28</sup>, and model (2), containing also *EDU*, *FERT* and the country and time dummies as exogenous variables, are estimated with the five mentioned estimation methods (OLS, FE, RE, IV and System-GMM)

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<sup>28</sup> and a lagged endogenous variable for the System GMM estimation

and for all three specifications of female labour market participation (*FLF*, *FAR*, *RAR*). The models are estimated based on the complete data base as well as based on limited data sets (OECD countries only; SSA countries only; non-OECD countries only; without observations of the 1960s and 1970s, without outliers).

The combination of the various estimation models, estimation methods and specifications leads to a multitude of regression results. The following presentation of results highlights the most important ones, classified by specification.

### **3.1. Female share of the labour force (*FLF*)**

Table 13 shows the estimation results of model (1) with the female share of the labour force (*FLF*) as endogenous variable. The first and second column show the regression results for pooled OLS estimations, the second column for the fixed effects model, the third column for the random effects model, the forth column for the IV-estimation and the last column for the System GMM estimation.

For pooled OLS, fixed effects, random effects and IV estimation, the coefficient of *InGDP* is significantly negative, and the coefficient of  $(\ln GDP)^2$  is significantly positive. Comparing FE and RE results, the Hausman Test suggests that the fixed effect specification is superior the random effects specification in controlling for unobserved country-heterogeneity in the magnitude of the time-series relationship between the female labour market participation and economic development. The Hausman test's Chi<sup>2</sup> (137,75) shows that the difference of the estimation results of both models is systematic. The Hausman test's F-value (429,24) indicates that the hypothesis that the country specific variables have no impact on the endogenous variable must be rejected.<sup>29</sup> Hence, the results of the random effects model are no longer presented.

Concerning the IV-estimation results, the standard errors are not higher than those of the pooled OLS, FE or RE regressions. The fact that the coefficients of the IV-estimations are somewhat smaller than those of the pooled OLS regression indicates that the pooled OLS regression overestimates the real impact of *InGDP* on *FLF*. Furthermore, the specification is not over identified, as there are not more instruments than regressors and so the equations (moment conditions) do not outnumber the variables (coefficients).

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<sup>29</sup> Fixed effects estimation's result: F test that all  $u_i = 0$ :  $F(173, 3850) = 429.52$ ; Prob. > F = 0.0000.

Concerning the System GMM estimation, table 13 shows coefficients for  $\ln GDP$  and  $(\ln GDP)^2$  that are not significant. Only the coefficient of the lagged dependent variable  $L.FLF$  is significant, indicating that 86,2% of the female share of the labour force is explained by its own past values.

The fit of the basic model is relatively weak for all estimation methods ( $R^2$  varies between 0.094 and 0.1498). As the fixed effects and the random effects models take explanatory variables which are constant over time into account, these estimation models have a slightly better fit than the OLS model.

Table 14 shows the estimation results of the multivariate model (2) with the female share of the labour force as endogenous variable, for pooled OLS (with and without  $EDU$ ), fixed effects, IV- and System GMM estimation. Now, also for the System GMM estimation, the coefficients of  $\ln GDP$  and  $(\ln GDP)^2$  are significant. As the System GMM estimation is the most appropriate estimation method for the used data, I interpret the regression results of the last column in more detail. The positive coefficient of  $(\ln GDP)^2$  confirms the “feminisation U” hypothesis, as it indicates the curve’s minimum. As  $(\ln GDP)^2$  is a function of  $\ln GDP$ , the coefficient of  $\ln GDP$  (-3,111) and of  $(\ln GDP)^2$  (0,223) must not be interpreted separately. The first derivation of the estimated function shows that the impact of an increase of  $\ln GDP$  on  $FLF$  depends on the level of  $\ln GDP$ :

$$FLF = 18,87 - 3,111 \ln GDP + 0,223 (\ln GDP)^2 \quad (11.5)$$

$$\frac{\delta FLF}{\delta \ln GDP} = -3,111 + 0,446 \ln GDP$$

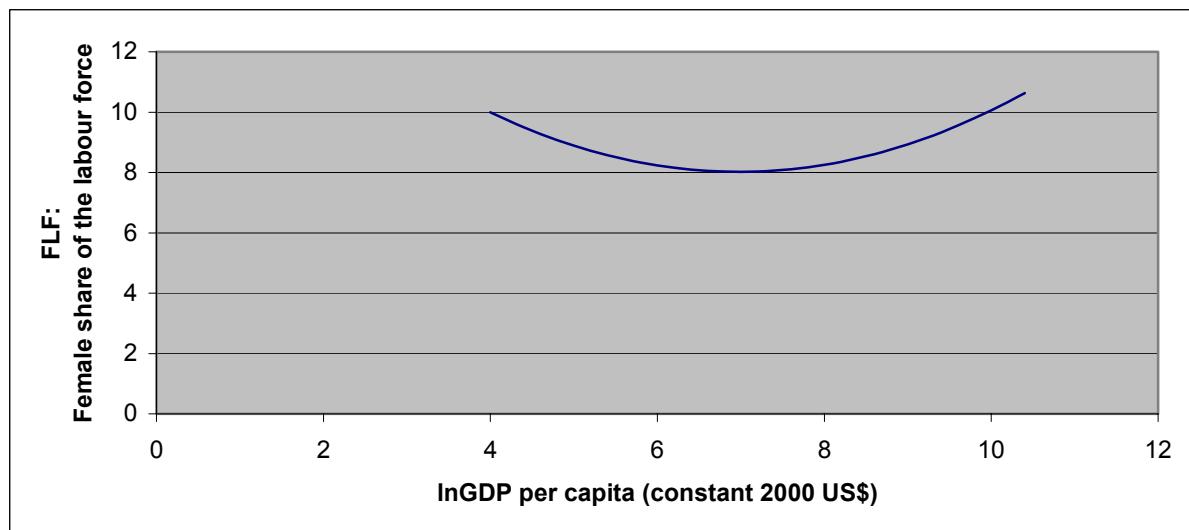
$$\frac{\delta FLF}{\delta \ln GDP} = 0 \Leftrightarrow \ln GDP = 7$$

An increase of  $\ln GDP$  decreases the female share of the labour force for small levels of  $\ln GDP$  ( $\ln GDP < 7$ ) and increases  $FLF$  from a higher level of  $\ln GDP$  on ( $\ln GDP > 7$ ). This leads to an U-shaped pattern between  $FLF$  and  $\ln GDP$ .

As the coefficients of  $\ln GDP$  and  $(\ln GDP)^2$  can not be interpreted separately, they cannot be tested independently from each other. The F-tests (for pooled OLS, the fixed effects and the IV estimation) as well as the Wald Chi<sup>2</sup>-test (for the random effects) indicate a high common significance of  $\ln GDP$  and  $(\ln GDP)^2$ .

To illustrate the relationship between  $FLF$  and  $\ln GDP$  indicated by the coefficients of  $\ln GDP$  and  $(\ln GDP)^2$ , I calculate the accompanying  $FLF$  for every level of  $\ln GDP$  ranging between 4,03 and 10,77, which are the minimum and the maximum of  $\ln GDP$  according to the prepared data set (see table 2). The calculation is based on equation (5), which contains values of the constant and the coefficients for  $\ln GDP$  and  $(\ln GDP)^2$  estimated by the System GMM model. As the illustration can only be two-dimensional, the other exogenous variables are not taken into account. Figure 10 illustrates a clear U-shaped relationship between  $FLF$  and  $\ln GDP$ .

**Figure 10: Female share of the labour force against  $\ln GDP$ : System GMM, model (2)**

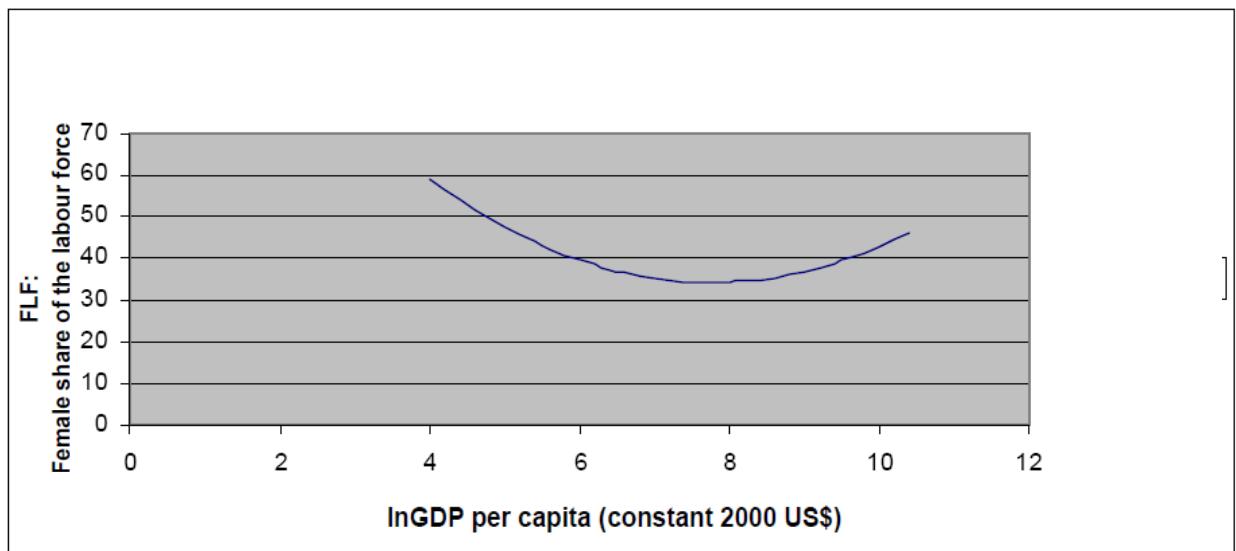


Source: own calculations

Like the calculation above, the figure indicates that the minimum of the curve is located at a  $\ln GDP$ -value of 7, which is around 1.100 US\$ per capita per year. The corresponding  $FLF$ -value is around 8%. According to the figure,  $FLF$  varies only between 8% and 11%, because  $L.FLF$  is included as exogenous variable in the System GMM estimation model, and therefore around 80% of the female share of the labour force is explained by its own past values.

Figure 11 illustrates the U-shaped curve based on estimations that result from a System GMM estimation of model (2) without  $L.FLF$  as exogenous variable (estimation results not shown here).

**Figure 11: Female share of the labour force against  $\ln GDP$ : System GMM, model (2), without  $L.FLF$  as exogenous variable**



Source: own calculations

Here,  $FLF$  varies between 30% and 60%. Without the exogenous variables  $L.FLF$ ,  $FERT$ ,  $EDU$ ,  $DV1980s$  and  $DV1990s$ ,  $FLF$  varies between levels of 20% and 50%, which corresponds to the variation supposed by the data scatter in figure 8.

Furthermore, the correlation between the fertility rate and the female share of the labour force is negative for all estimation methods. The dummy variables for OECD and SSA are positively correlated with the dependant variable, whereas the dummies for Latin America, North Africa and the Middle East as well as that for Muslim countries are negatively correlated with the dependant variable. Compared to the estimation results of model (1) in table 12, taking other explanatory variables into account significantly improves the regression fit of all estimation methods ( $R^2$  varies between 0,304 and 0,5418). On the other hand, the high values and high significance of most of the regional dummy variables indicates that country specific effects are very important. This implies that even model (2) does not capture the individual impacts on female share of the labour force very well. However, taking into account the educational attainment of women ( $EDU$ ) in the pooled OLS regression does not improve the fit, but reduces the number of observations by about 40%. Moreover, the coefficients of  $EDU$  are not significant.

I run the same regressions of model (2) again with a data set excluding the outliers pointed out by figure 8, which are observations of the oil exporting countries and the countries of the

former Eastern Bloc.<sup>30</sup> For all estimation methods, the values of the coefficients of  $\ln GDP$  and  $(\ln GDP)^2$  rise in value (estimation results not shown here). For the OLS regression with  $EDU$  as exogenous variable, for example, the coefficient of  $\ln GDP$  is -12,50 and the coefficient of  $(\ln GDP)^2$  is 0,82. Hence, dropping the outliers further supports the validity of the “feminisation U” hypothesis suggested by the estimation results.

### **3.2. Female activity rate (*FAR*)**

Table 15 shows the estimation results of model (2) with the female activity rate (*FAR*) as endogenous variable, for pooled OLS (with and without *EDU*), fixed effects, IV- and System GMM estimation. Regression results of model (1) are not shown here, because they are similar to those of model (2) and the goodness of fit of model (2) is better than of the basic estimation model (1).

For all estimation methods, the coefficients of  $\ln GDP$  and of  $\log GDP^2$  are in line with theory: The positive coefficients of  $\log GDP^2$  indicate the curve's U-shape also for the *FAR*-specification, which confirms the robustness of the findings. Yet, the coefficients of  $\ln GDP$  and  $(\ln GDP)^2$  are not significant for the FE-model. The graph based on the FE results, illustrated in figure 12, shows a strictly declining branch and hence gives no evidence for a “feminisation U”.

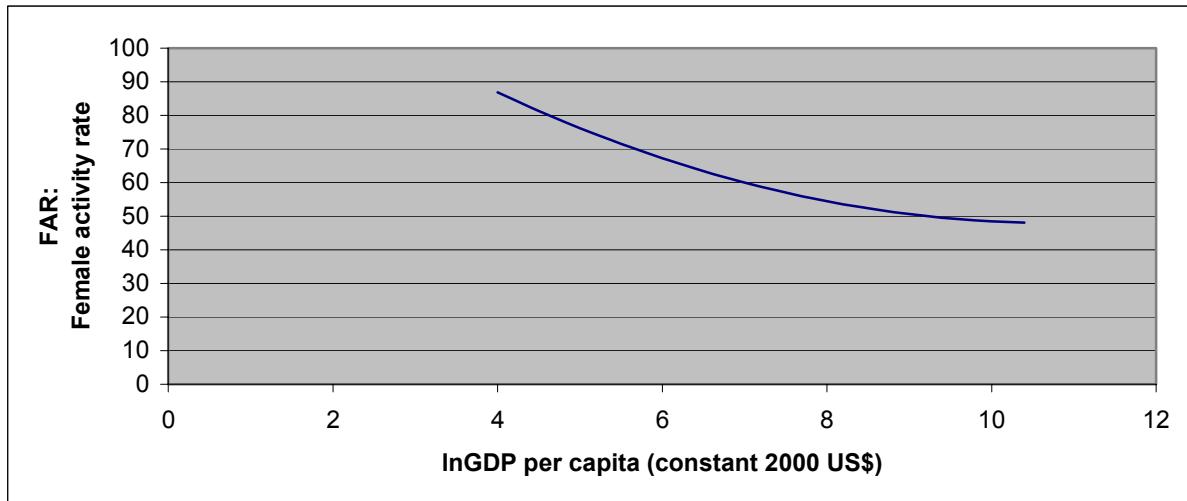
Yet, as the FE-coefficients of  $\ln GDP$  and of  $(\ln GDP)^2$  are not significant, one can not make clear statements about the curve progression.

One may think of differences in the data structure as reasons for the finding that the results of the *FAR*-specification are less convincing than those of the *FLF*-specification. For example, *FAR*-measures contain observations from the 1960s and 1970s whereas *FLF*-measures contain observations from 1980 on only. It is possible that the branch in figure 12 is strictly declining due to the observations from the 1960s and 1970s. This goes especially for SSA countries, because the lessening role of the subsistence economies mainly took place in these two decades and the Structural Adjustment Programs that brought back women in the labour market, started to have an effect only from the 1980s on (c.f. Stiglitz, 2002).

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<sup>30</sup> Oil exporting countries (OPEC): Algeria, Angola, Ecuador, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates, Venezuela. Eastern Bloc: Bulgaria, Czech Republic, Slovakia, Hungary, Poland, Romania (without East-Germany).

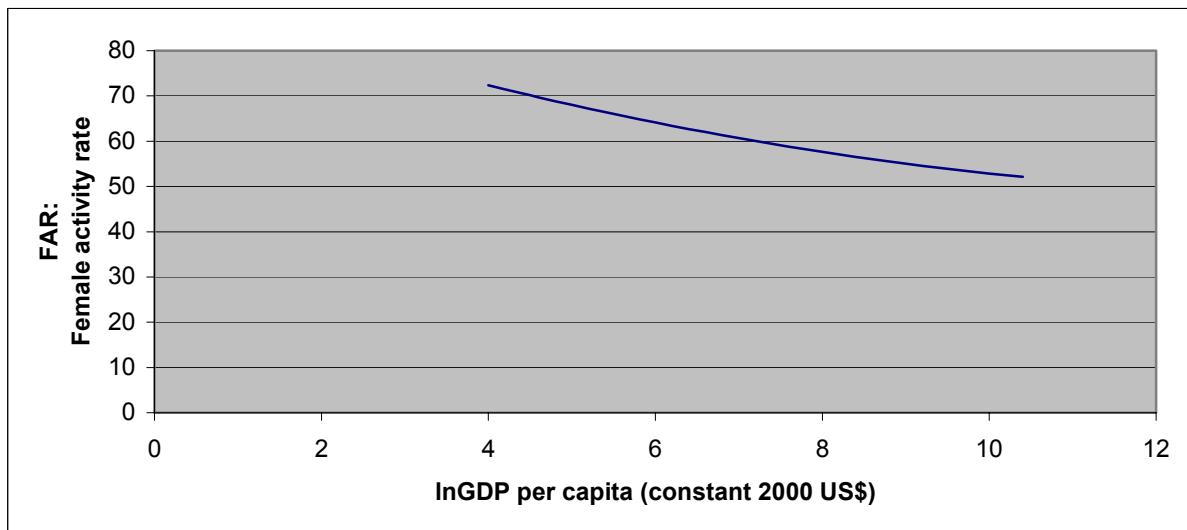
**Figure 12: Female activity rate against InGDP: fixed effects, model (2)**



Source: own calculations

Hence, I re-estimate model (2) with *FAR* as endogenous variable based on data without observations from the 1960s and 1970s. Estimation results are shown in table 16. Here, for all estimation methods, the coefficients of  $(\ln GDP)^2$  stay positive, but those of the FE estimation do not become significant. The graph based on these insignificant FE results, shown in figure 13, still shows no evidence for a “feminisation U”.

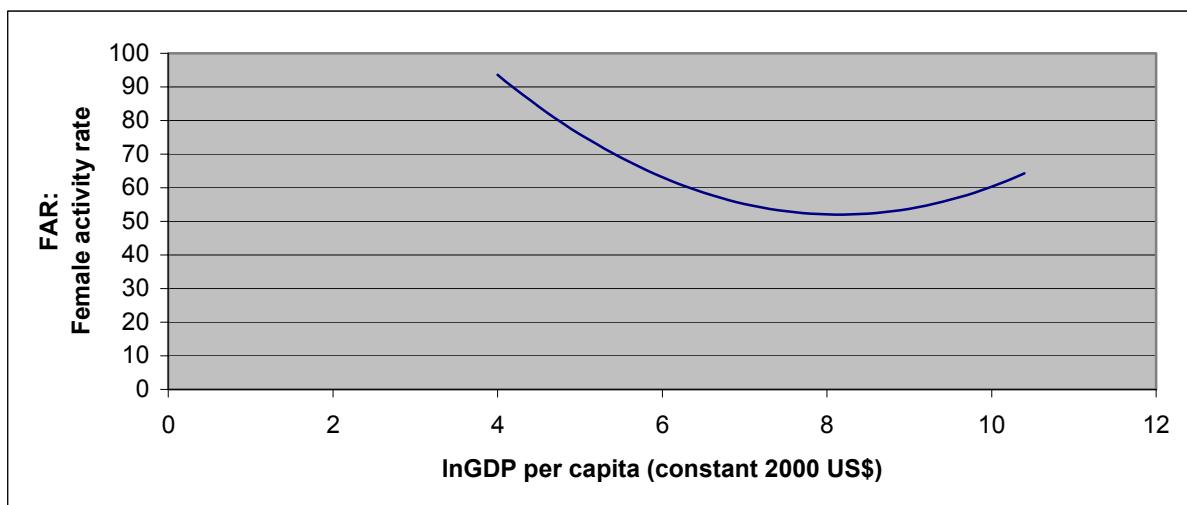
**Figure 13: Female activity rate against InGDP: fixed effects, model (2), without 1960s and 1970s**



Source: own calculations

However, the significantly positive coefficients of  $(\ln GDP)^2$  for the OLS, FE and System GMM model in table 16 imply that concerning the *FAR*-specification, the declining branch of the “feminisation U” is not only dominated by observations from the 1960s and 1970s. The graph based on the OLS results (with *EDU*) in figure 14 shows that even without observations from the 1960s and 1970s, the sharp bend in the curve does not disappear.

**Figure 14: Female activity rate against *InGDP*: pooled OLS, model (2), without 1960s and 1970s**



Source: own calculations

Yet, the fact that the FE-results stay insignificant suggest that the additive observations for the 1960s and 1970s do not explain why the FE results of the *FAR*-specification are less convincing than those of the *FLF*-specification.

### 3.3. Ratio female/male activity rate (*RAR*)

Another difference in the data structure between *FLF* and *FAR* is that *FLF* measures the share of women in the *total* labour force and therefore *FLF* takes into account the number of working *men* in contrast to the female activity rate (*FAR*), which accounts for the share of active women in the *female* working age population. Hence, I re-estimate model (2) with the ratio of female to male activity rates (*RAR*) as endogenous variable. Like *FLF*, this variable takes into account the number of working men.

Table 17 shows the estimation results of model (2) for pooled OLS (with and without *EDU*), fixed effects, IV- and System GMM estimation. For all estimation methods, the coefficients of

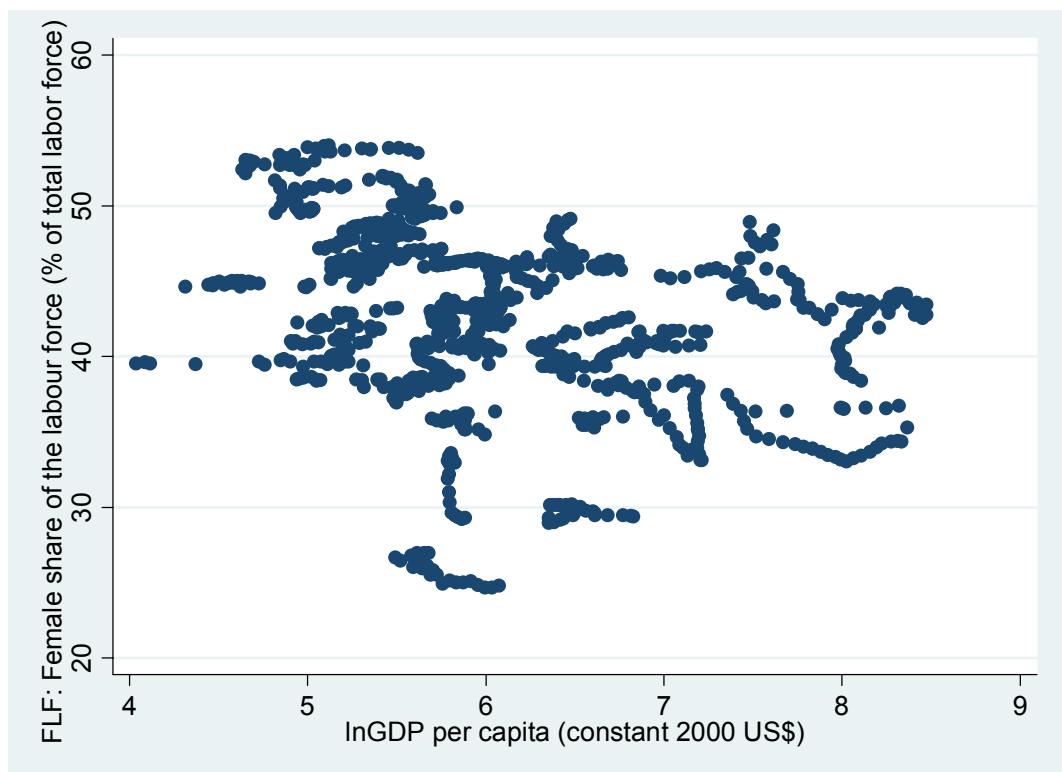
$\ln GDP$  and  $(\ln GDP)^2$  are consistent with the theory, but the FE-coefficients are still not or very little significant. Hence, the definition differences do not explain why the FE results of the *FAR*-specification are less convincing than those of the *FLF*-specification, either.

#### 4. Cluster analysis

##### 4.1. Country analysis

It is possible that for the *FAR*- and *RAR*- specification, the insignificant coefficients of  $\ln GDP$  and  $(\ln GDP)^2$  result from the FE-estimation technique itself, as the fixed effects model captures only within-country variation. To focus on within-country variation more precisely, I estimate the FE-model based on a smaller data set containing only subgroups of homogenous countries, namely OECD countries and SSA countries. Table 18 shows the regression results for the *FLF*-, *FAR*- and *RAR*-specification, based on model (2). For OECD countries, the coefficient of  $\ln GDP$  is significantly negative and the coefficient of  $(\ln GDP)^2$  is significantly positive, not only for the *FLF*-specification, but now also for the *FAR*- and *RAR*-specification. This suggests that for OECD countries, the “feminisation U” hypothesis can be confirmed also for within-country variation. For SSA countries however, the coefficients of  $\ln GDP$  and of  $(\ln GDP)^2$  change sign and are not significant, regardless of the specification. Figure 15, which scatters the *FLF* against  $\ln GDP$  for SSA-countries only, still supposes a “feminisation U” for SSA-countries, but suggests a dominating declining branch.

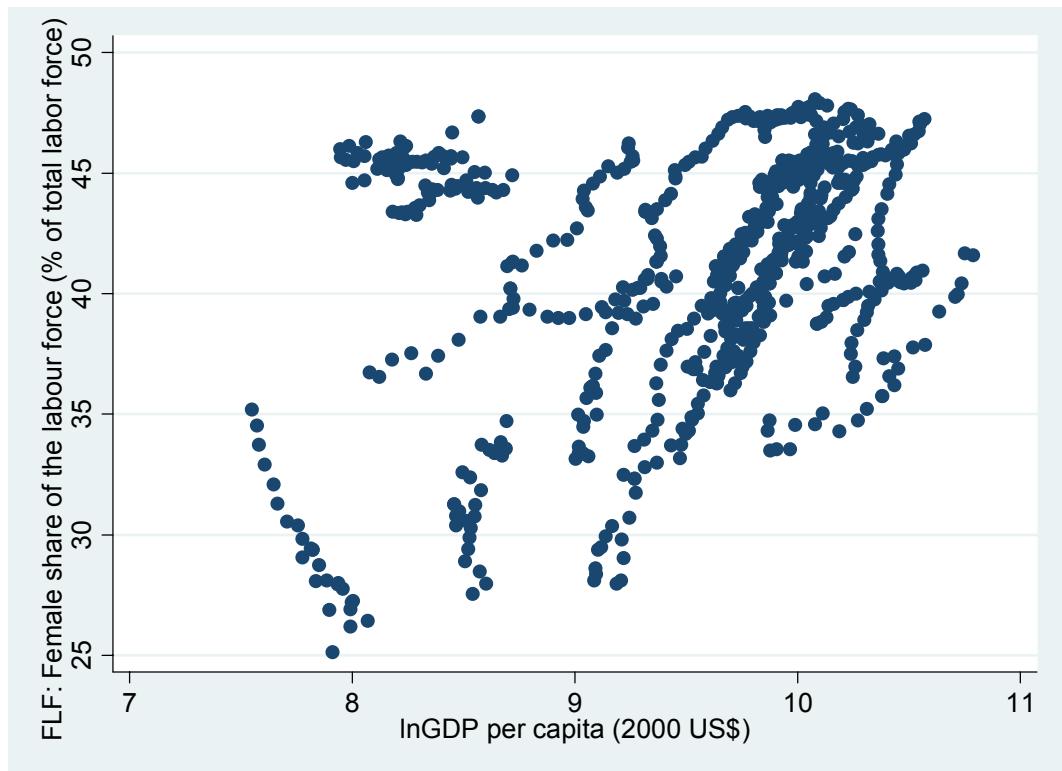
**Figure 15: Female share of the labour force (FLF) against InGDP: SSA countries**



Source: own calculations

A closer look at the data shows that for several SSA countries, as for example Gambia, Kenya, Senegal or Zimbabwe, the relationship between female labour market participation and *InGDP* is strictly negative, independent of the specification. At the same time, even though for the group of OECD-countries the “feminisation U” is confirmed for within-country variation, in some industrialised countries, like in the USA, in France or in Germany for example, there is a strictly positive relationship between female labour market participation and *InGDP*. Figure 16, which scatters the *FLF* against *InGDP* for OECD countries only suggests a dominating positive relationship between the two variables.

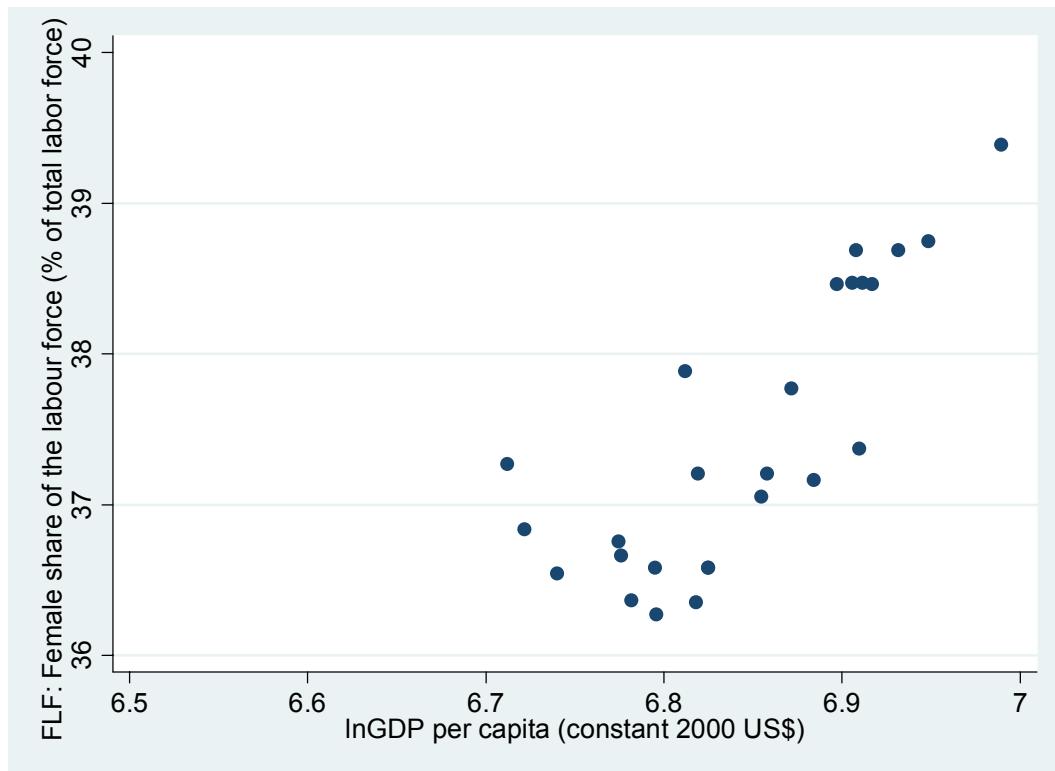
**Figure 16: Female share of the labour force (FLF) against  $\ln GDP$ : OECD countries**



Source: own calculations

The only countries that suggest a U-shaped pattern between *FLF* and  $\ln GDP$  within the observed time period are some growing tiger states of South-East Asia. Figure 17 shows the scatter of *FLF* against  $\ln GDP$  for the Philippines.

**Figure 17: Female share of the labour force (FLF) against  $\ln GDP$ : Philippines**



Source: own calculations

Yet,  $FLF$  ranges only between 36% and 39%. The “feminisation U” hypothesis, on the other hand, focuses on a much larger variation of female labour market participation along the economic development path (for  $FLF$  between 20% and 50% approximately, see figure 8). Hence, the scatter for the Philippines does not give country-specific evidence for the “feminisation U”. Furthermore, there are some countries that show atypical scatter forms. Some former Eastern Bloc countries, like the Czech Republic, Hungary or Poland, show a sudden extreme decline in the  $FLF$  in the early 1990s that is not accompanied by a similarly strong change in  $\ln GDP$  (figures not shown here). It is likely that in these countries, a change in the political and economic system in the early 1990s brought a decline in the state’s child care institutions. In addition, Turkey shows a strong decline of the  $FLF$  from 1980 until today though, within that period,  $\ln GDP$  increased, supposing a starting rise of the  $FLF$  (figure not shown here). Furthermore, Saudi Arabia displays a rising  $FLF$  during a period of declining  $\ln GDP$  since the 1980s, and still the country has one of the highest income levels and one of the lowest female participation rates in the world (figure not shown here).

What we can say so far is that the significant results of the pooled OLS, IV- and System GMM regressions confirm the “feminisation U” hypothesis, but the FE results and the data scatters for homogenous groups of countries suggest that the U-shaped curve is mainly founded on between-country variation.

## 4.2 Time analysis

To see whether certain time periods dominate certain sections of the U-shape curve, I scatter the *FLF* against *InGDP* separated by decades (figures not shown here). The U-curve still can still be detected in all figures, but in the 1980s the negative relationship and in the 2000s the positive relationship is slightly dominant. A time specific cluster analysis separated for OECD and SSA countries shows that for OECD-countries, in all decades there is a dominating positive relationship. For SSA-countries, in all decades there is a domination negative relationship. This indicates that the observed time period is probably too small to observe a whole U shaped curve for groups of homogenous countries. As in many developing countries the urbanisation and industrialisation processes just started (c.f. Cohen, 2006), it is likely that the turning point implementing an increase in female labour market participation is in the near future. For industrialised countries, the observed time period may also be too small to observe a whole U-shaped curve. Goldin (1994) shows for the USA and Marchand and Thélot (1997) for France, that in these two countries the period of decreasing female labour market participation already took place in the first period of the twentieth century (see chapter 1). Hence, it is likely that the “feminisation U” exists not only for between-country variation, but also for variations within countries, but can not be observed due to the limited time period of the data.

Not only the figures, but also the regression results indicate that time effects play an important role when focusing on within-country variation. Table 17, for example, shows that the time-specific dummy variables are highly significant for the FE-regression. In contrast, they are not significant for the System GMM regression that captures both within- and between-country variation. In order to intensify the control for time effects, I use a two way fixed effects model. This means instead of time dummies for each decade, I include time dummies for each period of the quinquennial data (*DV1960*, *DV1965*, ... *DV2005*) for all specifications of female labour market participation. Now, the estimated coefficients for *InGDP* and  $(InGDP)^2$  are even less significant, which may be due to a dummy variable trap (estimation results not shown here). Yet, the fact that the time dummies are again all highly

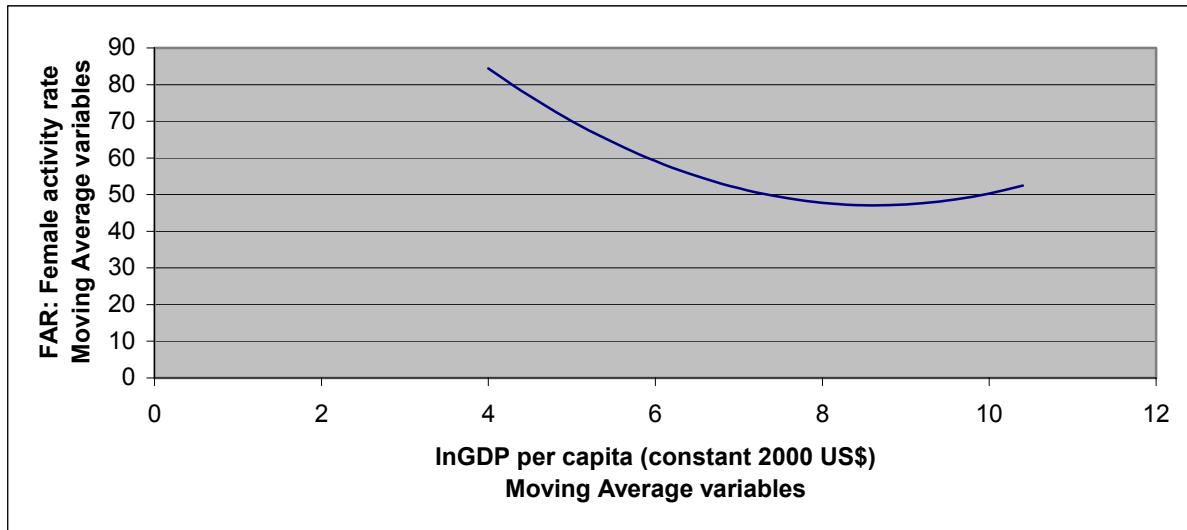
significant indicates that time effects, as for example time based shocks, need more consideration.

## 5. Moving Average

In order to smooth out time based shocks, such as periodical fluctuations of GDP, for example, I apply a moving average (MA) procedure. This procedure smoothes out short-term fluctuations and highlights longer-term trends or cycles. The moving average process creates a new series for each variable, in which each observation is an average of the nearby observations in the original series. A simple moving average (SMA) is the unweighted mean of a certain number of data points and therefore weakens the variation within a certain time period. Using the quinquennial data, I create uniformly weighted moving average-variables of all relevant variables (*FLF*, *FAR*, *RAR*, *InGDP*,  $(\ln GDP)^2$ , *FERT* and *EDU*) by using two lagged terms and three forward terms of each observation, and by including the current observation in the filter. Then I estimate the FE-model using the created moving MA-variables.

Table 19 shows the results for the OLS and the FE regression, with *FAR* (as moving average variable) as endogenous variable. The regression is based on model (2), meaning that *InGDP*,  $(\ln GDP)^2$ , *FERT* and *EDU* (as moving average variables) are included in the estimation model as exogenous variables. Comparing these results to the FE results of the regressions without moving average (table 15), the sign of the coefficient of *InGDP* stays negative and the sign of the coefficient of  $(\ln GDP)^2$  stays positive. However, the most striking is that the FE-coefficients of *InGDP* and  $(\ln GDP)^2$  are significant now. The corresponding graph based on these significant FE-coefficients, shown in figure 18, now shows a U-shaped form with a minimum point.

**Figure 18: Female activity rate against  $\ln GDP$ : fixed effects, model (2),  
Moving Average**



Source: own calculations

The coefficients stay significant also when applying the two way fixed effects model. This suggests that, as the FE-estimation method only measures within-country variation, fixed effects is the model which is most susceptible to time specific shocks, and so, for the FE-estimation, the use of moving average variables is the most appropriate. The FE-estimation results, based on MA-variables, now also prove the validity of the “feminisation U” hypothesis.

## 6. Granger Causality

All estimation methods used in this paper examine the statistical correlation between  $\ln GDP$  and female labour market participation, but one can not infer that there is a causal impact of economic growth on the female labour market participation. To test for the causality between  $\ln GDP$  on the one side and  $FLF$ ,  $FAR$  and  $RAR$  on the other side, I use the concept of Granger causality, again by analysing variables that are not observed contemporaneously (lags). First, to test the hypothesis that a change in  $\ln GDP$  leads to a change in the female labour market participation, I test if lagged values of  $\ln GDP$  provide statistically significant information about actual values of the female labour market participation. In a second step, to test the alternative hypothesis that a change in the female labour market participation leads to a change in  $\ln GDP$ , I test whether lagged values of the female labour market participation provide statistically significant information about actual values of  $\ln GDP$ .

The Granger causality test is based on the quinquennial data with means of 5 years for *FLF/FAR/RAR* and observations of the beginning year of the respective mean for *InGDP* and  $(\ln GDP)^2$ . This provides larger lagged observations than the use of the dataset with yearly observations would provide.

I first do an OLS-regression with the female labour market participation as endogenous variable and lagged values of the female labour market participation and lagged values of *InGDP* and  $(\ln GDP)^2$  as exogenous variables. For the *FLF*-specification, the estimated equation is as follows:

$$FLF_{it} = \beta_1 + \beta_2 L.FLF_{it} + \beta_3 L2.FLF_{it} + \beta_4 L.\ln GDP_{it} + \beta_5 L2.\ln GDP_{it} + \beta_6 L.(\ln GDP_{it})^2 + \beta_7 L2.(\ln GDP_{it})^2 + \varepsilon_{it} \quad (11.6)$$

*L.InGDP* stands for a one unit-lagged variable of *InGDP* and *L2.InGDP* stands for a two units-lagged variable of *InGDP*. For example, if a country's observation of *FLF* is the mean of the observations between 2000 and 2004, the corresponding one unit-lagged observations of *InGDP* and  $(\ln GDP)^2$  are from 1995 and the corresponding two units- lagged observations of *InGDP* and  $(\ln GDP)^2$  are from 1990. The corresponding one unit- lagged observations of *FLF* are between 1995 and 1999 and the corresponding two units- lagged observations of *FLF* are between 1990 and 1994.

The regression results (not shown here) show that both lagged values of *InGDP* and  $(\ln GDP)^2$  provide statistically significant information about actual values of *FLF*. For the *FAR* and *RAR*-specification, this is not the case. It is possible that the female labour market participation reacts to changes in *InGDP* only on the medium run, which means with a bigger delay than one or two time units. Therefore I run an OLS-regression with stronger lagged values of the female labour market participation and of *InGDP* and  $(\ln GDP)^2$ . I use three and four units-lagged values (15 years and 20 years lags) and expect a higher explanatory power of those of *InGDP* and  $(\ln GDP)^2$ . Table 20 shows the regression results. Indeed, all lagged values of *InGDP* and  $(\ln GDP)^2$  show a higher explanatory power. Now, lagged values of *InGDP* provide statistically significant information also about actual values of *RAR*.

To test the alternative hypothesis that a change in female labour market participation leads to a change in *InGDP*, I do an OLS-regression with *InGDP* as endogenous variable and lagged values of the female labour market participation and lagged values of *InGDP* and  $(\ln GDP)^2$  as exogenous variables.

For the *FLF*-specification, the estimated equation is as follows:

$$\begin{aligned} \ln GDP_{it} = & \beta_1 + \beta_2 L3.FLF_{it} + \beta_3 L4.FLF_{it} + \beta_4 L3.\ln GDP_{it} + \beta_5 L4.\ln GDP_{it} \\ & + \beta_6 L3.(\ln GDP_{it})^2 + \beta_7 L4.(\ln GDP_{it})^2 + \varepsilon_{it} \end{aligned} \quad (11.7)$$

Table 21 shows the regression results. For all three specifications, none of the lagged values of female labour market participation (*FLF/FAR/RAR*) provides statistically significant information about actual values of *lnGDP*. The estimation results show that a change in *lnGDP* Granger-causes a change in the female labour market participation and that this effect appears time-lagged. Inversely, a change in the female labour market participation does not Granger cause a change in *lnGDP*. This supposes an unilateral impact from *lnGDP* to the female labour market participation, with the reservation that Granger causality does not imply true causality.

## 7. Conclusion

This chapter has examined the question of how growth affects female labour market participation empirically. As it is recognised today that female labour market participation positively impacts growth, policy makers risk assuming intuitively that the inverse impact is positive, too. Yet, concerning the impact of growth on female labour market participation, until today both theory and empirical analysis show contradictory findings. On the theoretical side, the “modernisation neoclassical” approach, which implies a strictly positive impact, stands in contrast to the “feminisation U” approach, which suggest a convex relationship. Recent empirical studies assume a “feminisation U”, but the estimation results, which are only based on cross country data, do not confirm the “feminisation U” hypothesis.

Hence, in this chapter I test the “feminisation U” hypothesis by using different specifications and further empirical methods, based on a large macro panel data set, which combines cross-sectional and time-series data. The panel data allows controlling for possible endogeneity problems, which exist due to an inverse causality between the exogenous and the endogenous variables. The use of lags and deviations of the exogenous variables limits the risk of obtaining biased estimation coefficients. I resort lags, respectively deviations, several times in this chapter, when preparing data, when creating instrumental variables (2SLS), when estimating with fixed effects and System GMM, when creating Moving Average variables and when applying Granger Causality tests.

Furthermore, the larger data set allows testing for the robustness of the empirical findings by using different specifications for female labour market participation. I use three specifications, namely the female share of the labour force (*FLF*), the female activity rate (*FAR*) and the ratio of the female to the male activity rate (*RAR*).

The estimations are based on five estimation methods (OLS, FE, RE, IV and System-GMM). There are two main estimation models. Model (1) contains only *InGDP* and  $(InGDP)^2$  as exogenous variables. Model (2) contains also education, fertility and country and time dummies as exogenous variables. The models are estimated based on the complete data base as well as based on limited data (only OECD countries, only Sub-Saharan Africa countries, without observations of the 1960s and 1970s, without OPEC and former Eastern Bloc countries as outliers).

The econometric analysis confirms the “feminisation U” hypothesis. More precisely, the OLS, IV- and System-GMM results support the hypothesis for all specifications of the female labour market participation and all estimation models. An illustration of the U-shaped relationship between *FLF* and *InGDP*, based on a System GMM estimation model without controlling for the dynamics of adjustment and other exogenous variables, indicates that the minimum of the curve is located at a *InGDP*-value of 7, which is around 1.100 US\$ per capita per year. *FLF* varies between 20% and 50%.

The empirical evidence that growth lowers women's labour market participation at early stages of development is of political interest. It suggests that in developing countries, economic growth encourages women's labour market participation only with policy-makers' intervention. Accompanying growth promoting policies with decent and productive work opportunities for women is a major challenge to prevent women from dropping out of the labour market or from getting stuck in low paid jobs in the informal economy. This is all the more true since encouraging female employment is growth promoting not only for developing, but also for industrialised countries.

Nevertheless, estimation results must be interpreted with care, because the estimation methods can not completely eliminate biases caused by endogeneity. The results are also biased because measures of female labour market participation are imperfect. In addition, the fixed effects-results lend weaker support to the “feminisation U”, especially for the *FAR*- and *RAR*-specification. A moving average (MA) procedure that smoothes out time-specific shocks effects confirms the U-curve also for the fixed effects model. However, the weaker

fixed-effects results and the time- and country-specific cluster analysis suppose that the U-curve is dominated more by between-country variation than by within-country variation. This probably goes back to the limited time period of the data. For most countries it may not be enough to observe only 24 years (for *FLF* as endogenous variable) or 40 years (for *FAR* and *RAR* as endogenous variable) to show a country's whole U-curve. The Granger causality tests also suppose that female labour market participation reacts to changes in *InGDP* with considerable time delay.

Furthermore, the atypical relationship between female labour market participation and economic development in countries like Saudi Arabia or the Czech Republic, Hungary and Poland suggest that economic development alone can not always sufficiently explain the development of women's labour market participation. The countries mentioned above rather suggest that political and social institutions have a fundamental influence on the female labour market participation (c.f. Morisson and Jütting, 2005). Saudi Arabia for example has one of the highest income levels and one of the lowest female participation rates in the world. This can partly be explained by the fact that Saudi Arabia owes its high income level largely to the export of oil and hence obtains a rent which is hardly produced by human capital. Concerning the former Eastern Bloc countries, the rapid decline of female labour market participation in the 1990s can partly be explained by the fact that the transition to market-oriented economies, which was accompanied by a transformation of hidden unemployment to explicit unemployment, tended to effect women more than men. Moreover, the change in the political and economic system in the early 1990s brought a decline in the state's child care institutions.

In order to keep the data set large, political and social determinants that change over time are not included in the estimation model. The limited data availability also makes it impossible to specify measures of female labour market participation. It would be interesting to examine female employment patterns more specifically, for example full-time equivalent employment rates and part-time work, compared between mothers and women without children. However, the used data sets do not offer such precise information for all countries and all years. Especially for developing and semi-industrialised countries, such specific data are hardly available. Moreover, for all countries, it is difficult to get these specific data for time periods before 1990. Hence, it is not possible to estimate a more specific model based without reducing significantly the number of observations. An analysis that focuses on political and social institutions and specific employment patterns necessitates limitating the data set to industrialised countries and recent time periods. Chapter 3 provides an analysis of the impact of family policy instruments on female employment patterns in the European

Union (27), followed by a case study for France and Germany that takes into account specific information about the country's socio-economic system and its prevalent family norms and values.

## **Chapter III:** **The impact of family policies on** **women's labour market participation in Europe**

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### **Introduction**

The Barcelona summit in 2002 confirmed the goals defined by the Lisbon European Employment Strategy by stating that member states should remove disincentives to female labour market participation. In Europe today, family policy is seen as a major instrument to encourage women, mothers in particular, to participate in the labour market (c.f. for example OECD, 2002, 2003, 2004, 2007). In this regard, the European Commission expects a lot from extending childcare facilities. All member states are required to develop childcare provisions to facilitate the reconciliation of work and family responsibilities. The Commission asked the European countries to each provide childcare for at least 90% of children between the ages of three and mandatory school age and for at least 33% of children under 3 years of age by 2010 (cf. European Council, 2002).

Yet it is too early to appraise the effects of the Barcelona targets on female employment in Europe. Moreover, other family policy instruments like tax and cash benefits and parental leave schemes may also play an important role on women's especially mother's employment. In these fields, family policy varies widely across Europe and there are no clear targets set by the European institutions (c.f. Plantenga et al., 2007). In Europe, in addition to employment and demographic objectives policies supporting parenthood are also aimed at improving family life, the reconciliation between work and family obligations and the well-being of children. Work-life balance has progressively gain ground on the policy agenda in most EU member states, as several surveys suggest that people who succeed in reconciling their work with family life are more satisfied with their family life. In general, the different aims of policies supporting parenthood in Europe can be classified in three categories. The first aim is a reduction of family and child poverty (including the promotion of children's well-being). The second aim is a support of fertility. The third aim is an encouragement of women's labour market participation and a reconciliation of work and family life (including equalisation aims like gender equality in terms of income, domestic work, social and political participation, work-life balance...).

Even though these three aims are regarded as equivalent by the European Commission, in many European countries family policies are designed mainly towards redistributive goals<sup>31</sup> at the expense of fertility and/or female labour market participation. Hence, in several European countries, family policy expenditures are high, but at the same time fertility rates and women's labour market participation rates are deficient. This is mainly due to the fact that these countries consider only particular impacts of family policy measures and consequently, policies supporting parenthood are conflicting in terms of poverty prevention, fertility and women's labour market participation. The analysis shows that in some countries, family policy instruments that mainly aim at reducing income poverty of families and children risk discouraging mothers from working. This is especially the case in countries with rather traditional family values (i.e. in Germany, Austria, several Southern European countries), in which the majority of policy makers regard mothers' labour market participation as detrimental for the children's well being and emphasise the importance of mothers' time devoted to children as well as the importance of reducing children's monetary costs. Nevertheless, the analysis also shows that the three objectives are not necessarily incompatible as such. Whether or not a country succeeds in effectively combining the objectives in a coherent family policy mix depends on the specific characteristics of the family policy instruments.

The first part of this chapter gives an overview of the main family policy instruments in Europe and shows how the available literature discusses their impact of family policy instruments on mothers' employment patterns. It becomes clear that elaborating not only the specific impact of one family policy instrument, but the overall impact of a country's family policy on mothers' employment necessitates detailed information about a country's socio-economic system and its prevalent norms and values. Statistical complexity and data availability make it difficult to assess the overall effectiveness of various family policies that have been implemented to date in all the 27 EU member countries. Moreover, institutional differences complicate the comparison between the impacts of family policies between 27 European countries.

With a view to provide a detailed and compelling comparative analysis of family policy impacts, I focus on only two European countries in the second part of this chapter. I present a case study of France and Germany. These two countries are relatively well suited to a comparative analysis: Despite the general similarity of their socio-economic systems, Germany and France display very different levels of fertility and female employment patterns. I investigate the intriguing question of whether differences in family politics can contribute to

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<sup>31</sup> Family policies may focus on redistributing income from high- to low-income families (vertical redistribution) or from small to large families (horizontal redistribution).

understanding the different levels of female employment. Several studies highlight the important differences in childcare infrastructure (in-kind benefits) between the two countries (c.f. Fagnani, 2004, for example). My analysis goes further in assuming that differences in financial assistance to families (cash benefits) between the two countries also play an important role in explaining the differences in female labour market participation.

## **1. The impact of family policies on women's labour market participation in the EU (27)<sup>32</sup>**

In this chapter I examine the available literature on the impact of family policies on the labour market participation of mothers in Europe in recent years. The literature presented in this chapter is organised as follows: Firstly, I scrutinise studies that make linkages between the presence of children and mothers' employment: I discuss the impact of children on mothers' employment and unemployment rates in general. I specify the impact of children, their age and their number on mothers' working time patterns, always comparing the effect of children on mothers' employment to the one on fathers' employment and I analyse the impact of children on the gender division of labour and on gender equality including income and career aspects. Secondly, I review the theoretical and empirical literature exploring the impact of family policies on mothers' labour market participation. I divide family policy instruments into three main categories, which are the tax and cash benefit system, parental leave benefits and childcare assistance and I discuss the overall impact of family policies on female labour market participation for European countries by pointing out the limits of this approach.

### **1.1. The impact of children on women's labour market participation**

The literature based on Eurostat and other international harmonised data suggests that the presence of children in households has relatively little effect on men's working patterns but profoundly affects maternal labour market behaviour by interrupting, reducing or curtailing mothers' involvement in paid work. Hence, the presence of children partly explains the lower earnings for women. The impact of children on mothers' labour market behaviour and earnings, their economic security and their career opportunities are presented more broadly as "indirect" costs of children (c.f. OECD, 2007). Increasing female employment rates have

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<sup>32</sup> Section 1 developed on the basis of the collaboration with Marie-Thérèse Letablier (CNRS Paris), in the course of the elaboration of a comparative study of the "costs of raising children and the effectiveness of supporting parenthood policies in 27 European countries" for the European Commission.

become a key component in the European Employment Strategy (c.f. Thévenon, 2004), as an attempt is to offset the economic effects of population decline and ageing. The target set by the European Union's Summit of Lisbon in 2000 is 60% for female employment rates in every European country<sup>33</sup>.

In recent decades, in Western Europe, mothers have increased their labour market participation. Yet, this is not valid for all European countries, although much of the literature tends to generalise from observing the EU (15) countries. In Central and Eastern Europe (CEE), women's labour market participation has been decreasing in recent decades. In these countries, many women worked and had children at the same time during the Soviet era, but during the transition period their employment rates fell sharply and to a greater extent than those of men. Nevertheless, even in EU (15) member states, the constraints on female employment vary widely from one country to another, resulting in marked differences in female labour market participation. The following subsections report in more detail the impact of the presence, the number and the age of children on mothers' employment patterns, including mothers' time devoted to paid work. I also consider the consequences of parenthood for the gender division of household and labour tasks and the gender wage gap.

### **1.1.1. Mothers' employment rates**

The European Labour Force Surveys (Eurostat LFS) and the European Household Panel (ECHP), which since 2001 is progressively replaced with data collection under the EU-SILC (Statistics on Income and Living Conditions) regulations, are the two major data sources used to compare men's and women's labour market participation and employment patterns in EU Member states. Both are based on sample surveys. Concerning the Eurostat LFS, the national employment surveys are based on individuals and are harmonised, for example by counting women in parental leave the same way in all countries (identical definitions). National employment surveys differ because, for example, in Sweden, women in parental leave are counted as active and in France as inactive. The EU-SILC's sample surveys are not based on individuals but on household panels. Therefore, the EU-SILC is more limited with regard to the number of observed units in comparison to the Eurostat LFS. However, the EU-SILC contains more detailed information about each household's behaviour and composition.

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<sup>33</sup> Definition "employment rate": the percentage of the working age population (ages 15 to 64) who are currently employed. A person is considered employed if they have worked at least 1 hour in "gainful" employment.

Several studies show how the proportion of women in the European working population has been growing consistently since the 1970s (c.f. Thévenon, 2007; Vlasblom, 2004). Recent Eurostat LFS data for all 27 EU member states indicate that the average gender employment gap (population aged 15 to 64) fell from 18,9% in 1996 to 14,2% in 2007.<sup>34</sup> This is mainly due to a rise in female employment rates. In 1996, in the 12 new member states, the employment gap, at 11,9%, was smaller than in the EU(15) (20,2%), but increased to 13,4% in 2007 whereas in the old member states the gap decreased to 14,5% in 2007. However, the evolution of the employment rates over the last decade in Eastern Europe has to be interpreted with care: In the 1990s in Eastern Europe, the female as well as the male employment rates fell strongly, mainly due to the transition to a market economy. They started to rise again due to an upturn in the economy when these States became EU members in 2004. The gender employment gap continued to be lowest in the Northern countries and highest in the Mediterranean countries in 2007.

Female unemployment rates tend to be underestimated because women with young children, especially married ones, who are not in paid employment may not declare themselves to be „unemployed“ even though they would like to work, (c.f. Jaumotte, 2003 for OECD countries). At the same time, women suffer from higher long-term unemployment rates than men. In 2007, on average in the EU (27), 3,3% of women were long-term unemployed as compared to 2,8% of men according to Eurostat LFS data using ILO definitions, but the differences in long-term unemployment rates between women and men vary widely across countries (up to 4,8 percentage points in Greece).

Based on Eurostat LFS data, de Hénau et al. (2004)<sup>35</sup> emphasise that the employment gap between men and women in Europe is mainly due to motherhood, since it is mothers rather than fathers who are faced with a dichotomous choice between paid work and raising children. In analysing the impact of children on employment, de Hénau et al. (2007) focus on the labour market participation of men and women aged between 25 and 49 years, which is widely considered to be the age bracket when mothers devote most time to parenting.<sup>36</sup>

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<sup>34</sup> The gender employment gap is the difference between the male and the female employment rate, whereas the employment rates are calculated by dividing the number of women (men) aged 15 to 64 in employment by the total female (male) population of the same age group. The employed population consists of those persons who during the reference week did any work for pay or profit for at least one hour, or were not working but had jobs from which they were temporarily absent.

<sup>35</sup> Results from the MOCHO EU Research Network 2004 (The rationale of Motherhood Choices: Influence of Employment Conditions and Public Policies). Scientific partners: Danièle Meulders, Jacques Le Cacheux, Siv Gustaffsson, Daniela Del Boca and Haris Symeonidou.

<sup>36</sup> Even though in some countries the age of mothers at first birth may be lower for some groups of women and men may become fathers at a later age. Moreover, some countries record very high teenage pregnancy rates. Furthermore, the age at which children leave home has been increasingly postponed and also, the burden of caring for older relatives befalls women more so than men.

The data presented in table 22 in the appendix show that fathers in the 25 to 49 age group are more likely to be employed than men without children in all EU member states (European Labour Force Survey, 2006). By contrast, in all countries, mothers' employment rates are lower than those of women without children (aged under 12). The average EU (27) employment gap between women without children and mothers is 13.6 percentage points.<sup>37</sup> The gap is much smaller (below 5 percentage points) in Portugal, Romania and Lithuania, but it is particularly large (more than 20 percentage points) in Malta, the Czech Republic, Hungary and Slovakia. The gap is also relatively large (between 15 and 20 points) in the UK, Germany, Estonia, Spain, Luxembourg and Austria. In these countries, employment rates are relatively high for women without children.

Mothers' labour market participation is particularly high in Finland, where the dual earner model of families is widespread. It is also relatively high in Portugal, which is an exception in the countries of Southern European with respect to women's labour market participation. One explanation may be that the low average wage level in Portugal obliges mothers to contribute to the household income (c.f. de Hénau et al., 2007). By contrast, the employment rate of mothers is far below the EU (27) average (62.4%) in the Mediterranean countries, since low female wages, insufficient childcare infrastructure, and persistently high unemployment may discourage mothers from working. However, persisting traditional role models (i.e. the male breadwinner family model) may also explain the relatively low labour market participation of mothers in Mediterranean countries.

The negative impact of children on female employment suggested by the Labour Force Survey is confirmed by several country-specific empirical studies: Pailhé and Solaz (2007), for example, find out that in France, 71% of women change their working situation after a first childbirth, 86% after a second childbirth and 91% after a third childbirth. (*Enquête Famille et Employeurs INED/INSEE 2004-2005*). Schippers and Vlasblom (2004) use estimation results of a female labour supply model to compute some decomposition analyses for six EU member states (data also based on the Labour Force Survey). They find out that large numbers of women leave the labour market when they have a first child, without indicating if and when they will return. To analyse the long term labour market behaviour of mothers in Europe, it is necessary to have time series data that allow to observe cohorts, but there are only a few countries that provide this kind of data, for example France (*Enquête INED Histoires de Famille*) or the Netherlands. Based on the Netherlands Family Survey for the years 1993-2003, Schippers and Vlasblom (2005) show that in the Netherlands the presence of children has costly consequences for mothers in terms of employment also in the long run.

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<sup>37</sup> Data are not available for Denmark, Sweden and Ireland. According to data from the EHCP, in Denmark and Sweden the gap is relatively low and on average in Ireland (c.f. Chaupain-Guillot et al., 2008).

Women who leave employment after child birth are unlikely to rejoin the labour market within ten years even.

The impact of the number and age of children on mothers' labour market participation has long been of interest to labour market analysts: de Henau et al. (2007), for example, find that, based on Eurostat LFS data (2005), the probability for mothers not to work increases with the number of children they have in all 27 EU member states. The difference between the employment rates of mothers and those of women without children is largest for mothers with three or more children in all countries. Using the wave 7 of the ECHP (EU (15), 2000), Chaupain-Guillot et al. (2008) show that the impact of the number of children on the labour market participation of mothers was the smallest in Sweden, Denmark, Spain and Greece. In Sweden, 75% of mothers with at least three children were in the labour force and more than 80% in Denmark, suggesting that the presence of young children did not prevent women from being economically active. In Spain and Greece, where overall employment rates for women were much lower, rates for mothers with three or more children were very similar to those of mothers with one or two children, that is to say relatively low. Drawing on a literature overview of the causal influence of children on mothers' working activity in France, Moshion (2007) concludes that mothers with one or two children are often in employment, whereas mothers with at least three children tend to withdraw from the labour market. Méda et al. (2003) confirm a particularly strong negative impact of the third child on the mothers' labour market participation in France, where only 16% of mothers with one child but over 40% of mothers with three children or more are not working (Enquête Emploi DARES/CREDOC 2002).

Using data from the Eurostat LFS for the years 1992 to 2005, Thévenon (2007) shows that the employment rates of mothers also vary with the age of the youngest child: in general in EU(27), the older the youngest child, the more likely it is that the mother will be in paid work. Thévenon (2007) further illustrates that in Eastern European countries, the UK and the Netherlands, mothers of children under 6 years tend to work less than those of older children. In these countries, most women take up work when the youngest child starts primary school at the age of six. This effect is most marked in Germany: Here, two out of three mothers whose youngest child is aged between 6 and 11 are employed, but less than one out of two mothers whose youngest child is aged between 3 and 5 is employed (c.f. Chaupain-Guillot et al., 2008). In France, the turning point for mothers' employment is somewhat earlier, since most children from the age of three are enrolled in pre-schools (c.f. Jonsson and Letablier 2005). Schippers and Vlasblom (2004) show that the negative impact

of the youngest child's age on the mothers' employment is lowest in Mediterranean countries, due to the relative stability of family networks which provide informal childcare.

However, the major differences in employment rates between men and women as well as between mothers and women without children cannot be interpreted as a "pure" motherhood effect, since other factors such as educational differences may also play a role. Furthermore, mothers may not stop working completely but may reduce their hours worked by working part-time. Overall employment rates do not reflect the employment "penalty" in the form of work time reduction, since the rates include all employed persons irrespective of hours worked.

### **1.1.2. Mothers' time dedicated to work**

Throughout Europe, women's full-time equivalent employment rates are lower than their overall employment rates. According to the European Labour Force Survey (2005) for the EU (15), the gap between women's full-time equivalent and women's overall employment rates is the smallest in Sweden and Denmark and the widest in the Netherlands (more than 75%), followed by the UK and Germany (40% each). Furthermore, in all European countries, the full-time equivalent employment rate of mothers is significantly below that of women without children. Hence, women with children tend to reduced working hours, mainly in the form of part-time work, more than men and women without children.

According to the LFS data (2007), in all European countries, the proportion of women (aged 15 to 64) in part-time work is considerably higher than that of men. In the EU(27), this share is on average 31,4% for women, four times higher than that for men (7,8%). As these numbers are regardless of the presence of children, it seems that part-time work is not only a means for reconciling work and family responsibilities but reflects a broad variety of situations. It may be used by men and women as a transition into and out of the labour market or as a flexible working arrangement imposed by employers on their employees, as documented by the Company Survey on Working-time and Work-life balance commissioned by the European Foundation for the improvement of working and living conditions (c.f. Anxo et al., 2007). The gender gap in hours of work may also be due to different preferences of men and women for work and leisure.

Yet, Apps and Rees (2008) find out that male and female preferences do not differ significantly and that the main part of gender differences in time dedicated to work are strongly associated with the age and number of children.

To identify the impact of parenthood on time dedicated to work, I focus on the part-time employment rates of women and men at the age of parenthood (20-49 years old) with regard to the presence of children in 22 European countries, as shown in table 23 in the appendix. The data are based on the Eurostat Labour Force Survey (2003). The definition of part-time work varies across European countries. The LFS, which contains harmonised measures of part-time work, defines part-time as work up to 30 hours a week. Based on this data, de Hénau et al. (2007) find out that the presence of children increases the difference in the working time patterns between men and women in all countries. On average in the 22 countries in 2003, 10,9 % of all working women without children worked part-time against 2,7% of working men without children. The presence of children reduces the proportion of men in part-time to 2,3%. At 4,7%, Lithuania is the country with the highest proportion of fathers working part-time. On the contrary, for women, the presence of children significantly raises the proportion in part-time work from the mentioned 10,9% to 15,4% on average.

This is especially true for the Netherlands, where more than one in two women with children, but only one in three women without children works part-time. Visser (2002) has dubbed the Netherlands the “first part-time economy” in Europe, since also the share of men in part time work is higher there than in other countries.

Part-time employment of mothers is also very frequent in the UK, Germany and Austria (over 30%). In these countries, women’s full-time employment rates have stagnated since the early 1990s and, as a consequence, the increase in female employment is mainly due to a rise in women’s part-time work (c.f. Buffeteau and Essafi, 2006). Chaupain-Guillot et al. (2008) argue that as these countries offer only limited childcare facilities to parents, part-time work appears to be a compromise for reconciling work and family responsibilities for mothers.

Visser and Yerkes (2005) confirm this. Comparing part-time work in the Netherlands, the UK and Germany, they argue that mothers’ part-time work emerges from preferences for what is considered in these three countries as the “second best option” for combining work and care responsibilities, but in Germany and in the UK it is more difficult to overcome the “marginalisation” of part-time workers than in the Netherlands. This holds also for France, where part-time work is also relatively wide spread, but numerous part-time workers would prefer to work full time. Hence, in many European countries, mothers’ part-time work does

not necessarily result from preferences, but from practical constraints. Moreover, in some of these countries, family norms and values do not necessarily encourage mother's labour market participation. In Germany for example, there exists the term "Rabenmutter" (raven mother as proxy for a uncaring, bad mother) for mothers working full-time.

Table 23 furthermore shows that mothers' part-time work is relatively low in Finland and in the Southern European countries. This is mainly because in these countries, motherhood rather leads to women exiting the labour market rather than reducing their hours worked. In the 10 new member states, part-time work is also limited (mostly under 10%), mainly because in these countries, part-time work does not provide sufficient income for families.

Furthermore, several studies emphasise that the higher the level of education, the level of earnings and the better the working conditions for women, the higher is the probability for mothers to work full time (c.f. OECD, 2002; Rivaud and Ulrich, 2007; Méda et al., 2003; Marc, 2004). Nevertheless, the fact that in all 22 European countries there are significant differences in part-time employment rates between women without children and mothers shows that family reasons play an important role on mothers' time dedicated to work.

### **1.1.3. The division of labour within households**

The rise of women's overall employment rates and its relative high share of part-time work is also reflected in the division of labour within European households. As more and more mothers try to combine professional careers and childrearing, the number of households with only one male breadwinner is constantly decreasing all over Europe (Lewis, 2001) while the number of dual earner couples has been increasing rapidly since the 1990s. Table 24 shows the division of paid labour of couples with children under 15 (sources: Eurostat, OECD; 14 European countries, 2000).

**Table 24: Household situation: division of paid labour (household types in shares)  
(couples with children under 15), 2000**

	one bread winner	both full- time	husband ft / wife pt	both part- time	husband pt/ wife ft
<b>Germany</b>	39,7	26,1	32,9	0,6	0,7
<b>Belgium</b>	27,3	40,8	28,3	1,9	1,7
<b>Spain</b>	56,3	35,6	7,5	0,2	0,4
<b>Finland (2002)</b>	31,2	58,9	5,0	—	—
<b>France</b>	36,0	45,4	16,3	1,2	1,1
<b>Greece</b>	49,7	43,7	4,7	0,9	0,9
<b>Italy</b>	53,6	31,2	13,0	1,3	0,9
<b>Luxembourg</b>	51,2	25,7	23,2	—	—
<b>Netherlands</b>	32,7	10,8	52,9	2,3	1,3
<b>Portugal</b>	26,5	66,5	7,0	—	—
<b>UK</b>	29,8	28,6	40,0	0,7	0,9
<b>Ireland</b>	55,5	27,1	16,2	1,1	—
<b>Sweden (2002)</b>	13,0	39,4	39,1	—	—
<b>Denmark (1999)</b>	17,5	75,2	—	—	—

Sources: Eurostat (2002), OECD (2005) Babies and Bosses

Only the Mediterranean countries, Luxembourg and Ireland still have a relatively high share of one breadwinner households (over 50 %). The share is the lowest in Sweden, Denmark, Portugal, Belgium and the UK (under 30%). In most of the observed countries, dual earner couples are the dominant norm. However, women's contribution to paid work varies across countries: On the one side, in Denmark, in more than 75% of dual earner couples both partners work full time and in Portugal in more than 66%. At the other side, average levels of female part-time work stay relatively high in all other countries. In the Netherlands, the UK and Germany, the dominant norm is a household in which the husband is working fulltime and the wife part-time. Households with both partners working part-time or with the husband working part-time and the wife working full time present a minority in all observed countries. Hence, despite the rising employment of women, the division of parental responsibilities stays rather traditional in most European countries. Furthermore, Moss and O'Brien (2006) point out that the traditional division can not only be found in households where the husband's income and status in working life is higher than the wife's, but is also found in households where the parents have equal education and incomes. Dribe and Stanfors (2007) show that even in Sweden, parenthood still promotes a traditional division of household tasks between couples in 2000, though the influence has been strongly declining since the 1990s. In summary, the literature shows that the impact of chidren on female employment and especially on mothers' work time patterns widely between the countries of the European Union.

In general, four country groups can be identified with regard to mothers' employment patterns:

- The first group contains countries with a generally high level of female employment. In these countries, the impact of children on the labour market participation of mothers is relatively low and mothers tend to continue working full time rather than reducing to part-time. These countries are Denmark, Sweden and Finland. Estonia, Latvia, Slovenia, Cyprus, Lithuania and Portugal also fit in this group, though their female employment rates are generally lower.
- The second group contains countries with relatively high levels of female employment, but the working activity of mothers displays a strong discontinuity: motherhood first leads to a work interruption and then to part-time work when the child gets older. Part-time rates of mothers are generally relatively high in these countries, which are mainly the Netherlands, the UK, Germany and Austria.
- The third group is similar to the second group, except that mothers change their professional activity only after the second child and go back to full time work earlier. As a consequence, overall part-time work rates are smaller than in the second group. This group is represented by France, Belgium, Luxembourg and Ireland.
- In the countries of the fourth group, motherhood mainly leads to work discontinuation and part-time work is rather uncommon. As female employment rates are rather low in general, the working activity of mothers appears to be quite continuous. These countries are primarily Spain, Italy, Greece and Malta. Poland, Hungary, Romania, Slovakia, the Czech Republic and Bulgaria can also be counted to this group, though their overall female employment rates are somewhat higher (50-60%).

#### **1.1.4. Gender equality**

The significant impact of motherhood on women's labour market participation also has costly consequences on gender equality in a wider sense: Disruption and gaps in women's employment biography may lead to work segregation, deterioration of working conditions and of access to social rights related to work as well as to income losses, career interruptions, income insecurity and financial dependence of women. Not only work cessation, but also work reduction to part-time work leads to precariousness for many mothers. Single parents are particularly concerned by employment penalties and its negative consequences on financial security (c.f. Fondazione G. Brodolini, 2005). Millar and Ridge (2001) emphasise that single parent families are at a higher risk of poverty than couple families, and on average

single mothers have poorer health than couple mothers. Data from the British Department for Work and Pensions (2005/2006), for example, illustrates that in the UK 47% of single parent families are below the Government-defined poverty line.

Table 25 in the appendix shows the gender pay gap for all 27 European countries, which is based on gross hourly earnings of men and women. In 2006, the gender pay gap reached 15 points on average in the EU (27), but was higher than 20 points in Estonia, Cyprus, Slovakia, Germany, the UK, Finland and Austria (source: Eurostat, LFS). The gap was below 10 points in Malta, Belgium, Slovenia, Ireland, Italy, Portugal, Romania and Greece. In most countries, the gender wage gap decreases much slower than the gender employment gap. To isolate the impact of motherhood on the gender pay gap, Sigle-Rushton and Waldfogel (2006) compare the earnings of women with children relative to childless woman and to men in eight European countries by using data from the Luxembourg Income Study. They find out that mothers' earnings lag behind those of women without children for all countries, but the gap varies widely between only 11% in the Nordic countries and up to 44% in Germany and the Netherlands. However, as the earnings of women without children also considerably lag behind those of men, the gender pay gap can not be interpreted as a pure motherhood effect. To single out the motherhood effect, Gregory and Connally (2008) identify the pay penalty of children for mothers for the UK. They show that while the gender gap has been narrowing for mothers working full time, the pay penalty has been rising for mothers working part-time, reflecting the polarisation of part-time jobs in low wage occupations. In addition, women often experience down-grading from higher-skill full time jobs into lower skill part-time occupations as they reorganise their working lives around the presence of children. The crowding of part-time jobs into low wage, low status occupations had already led to part-time workers being categorised as the new social underclass (c.f. Humphries and Rubery, 1995). The disadvantage of this underclass is growing despite legal regulations protecting part-time workers (c.f. Gregory and Connally, 2008). Furthermore, all over Europe, more and more regulated part-time work is transformed into more precarious forms of work, which especially affects women with children.

Several studies emphasise that in a variety of countries, the gender pay gap is mainly due to two factors, women's responsibility for childbearing and the segregation of jobs (c.f. Meurs, Pailhe and Ponthieux, 2007; Davies and Pierre, 2005; European Commission, 2006; England, 2005). Segregation occurs in the form of horizontal as well as in the form of vertical segregation. Horizontal segregation refers to the fact that men and women tend to work within different sectors of the economy, while vertical segregation denotes the empirical pattern of men occupying high positions to a larger extent than women. Table 25 shows that

although women record a higher educational attainment on average than men in all member states, gender segregation of occupations and economic sectors of activity persists. Estonia, Cyprus, Latvia, Lithuania, Slovakia and Finland display a high segregation in occupations whilst segregation in sectors is the highest in Estonia. As a result, women are underrepresented in economic sectors that are crucial for economic development (and where wages are higher). England (2005) points out that segregation and motherhood can be, but are not necessarily, related. Several comparative studies highlight the impact of motherhood on segregation in Europe, stipulating that high levels of female employment often go together with high levels of segregation in sectors that facilitate a reconciliation of work and family life (c.f. OECD, 2007; Gilles, 2007 and 2008). This is especially the case in the Nordic countries, though this segregation is not considered as conducive to gender equality. This holds inversely for the Mediterranean countries where low levels of female employment are associated with low levels of segregation. In addition, Apps and Rees (2008) alert to the fact that gender differences in labour supply behaviour may not only result in a gender wage gap, but inversely, the gender wage gap (due to segregation and discrimination) can also be the reason for gender differences in the labour supply. Hence, women's and especially mothers' reduced labour supply and reduced wage income are mutually dependent.

Since parental responsibilities are not equally shared between parents, beyond segregation and income losses motherhood may also lead to a limitation of mothers' participation in political and civic decision making. With respect to decision-making in the economic sphere, table 25 shows that the share of women among managers was 32,6% on average in 2006, but exceeds 35% in Poland, Hungary, France, Latvia and Lithuania. The share was notably lower in Cyprus and Malta. In 2007 and unchanged since 2004, on average for all 27 European countries only 23% of national parliament members are women (c.f. European Commission, 2008). The share exceeds 35% in Belgium, Spain, Denmark and the Netherlands and 40% in Finland and Sweden but is below 15% in Greece, Cyprus, France, Slovenia, Ireland, Romania and Hungary. It did not exceed 10% in Malta.

The disadvantaged position of women in the labour market raises women's poverty risk, both at the age of raising children and at the age of retirement. The average share of people living in households at risk of poverty (income below the threshold set at 60% of the median income) was significantly higher for women than for men in the EU (25) (25% vs. 16%; c.f. European Commission, 2008).

Finally, the discussed literature shows that that labour market participation and the amount of time dedicated to paid work by women between 25 and 49 years are closely linked to the

presence, and moreover the number and the age of children. Furthermore, mothers' employment penalty caused by the presence of children has further costly consequences for mothers. This suggests that the change in women's labour market behaviour induced by children can not only be attributed to women's working time preferences, but rather to economic constraints that women face when children are present (c.f. Del Boca and Locatelli, 2007; Fagan, 2003; Bielenski, Bosek and Wagner, 2002).

The efforts and methods of family policies that are implemented by the State in order to alleviate mothers' employment constraints as well as in order to financially support households with children vary widely in Europe. Moreover, family policies themselves may impact women's labour supply decisions in a positive or negative way. Hence, the next section analyses whether differences in family policies can explain the discussed large differences in the impact of motherhood on female labour market participation within European countries.

## **1. 2. The impact of family policies on mothers' labour market participation**

The impact of children on mothers' labour market participation may be influenced by family policies that support parenthood and reduce the costs of raising children. Nevertheless, these policies can impact women's labour supply decision in a positive or negative way, depending on the instruments' characteristics. Since reconciliation of work and family life has become a major issue on the European agenda, a wide range of empirical literature has explored the impact of family policies on female employment.

A quick glance at women's employment rates and policy expenses dedicated to support parenthood shows that in Nordic countries, high women's employment rates are correlated with high level of government expenses dedicated to family policies. By contrast, in South European countries where public expenses dedicated to support parenthood are low, women's employment rates are also relatively low. The total "family/children" benefit expenditure that can be obtained from the Eurostat social protection expenditure (ESSPROS, EU (27), 2005).<sup>38</sup> The amounts vary from 0.8 % of GDP in Poland up to 3.8% in Denmark. The EU average is 2.1 % of GDP.

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<sup>38</sup> The "family/children" function is defined as "support in cash or in kind (except health care) in connection with the costs of pregnancy, childbirth and adoption, bringing up children and caring for other family members". It includes benefits that provide financial support to households for bringing up children, that provide financial assistance to people who support relatives other than children and that provide social services specifically designed to assist and protect the family, particularly children.

However, when considering all 27 European countries, the relationship between family policy expenses and female employment is not so clear and a closer look at particular family policy instruments is necessary to assess the impact of family policies on women's labour market participation and women's employment patterns. "Family/children" benefits may be grouped in three categories, which are recognised as the three core measures of family policy: cash support (benefits and tax reliefs), child-rearing allowance during parental leave, and childcare support. An overview of the empirical literature will show that the instruments' particular and joint impact on mothers' labour market participation differs widely between countries.

The following analysis basically focuses on family policy instruments that are based on the traditional family model, which is a married couple with children. This procedure has the purpose of giving a compact overview on family policies and their impact on female employment. However, the limited nature of the analysis does not do justice to today's reality. All over Europe, it is widely recognised that the traditional family is no longer the only family form. In recent decades, European families have changed considerably in their structure and composition and family living arrangements have diversified. Family transitions are characterised by a lower incidence of marriage and an increase in divorce and separations. More and more couples live unmarried in cohabitation. Allover Europe, the number of extramarital births is rising continuously and single parents form a noticeable and increasing part of families. Reconstituted families become more and more common and socially accepted (c.f. Hantrais, 2004). According to Eurostat data (2002), the average number of marriages per 1.000 population in the EU (15) fell by nearly 34% between 1960 and 2000 (from 7,7 to 5,1). The divorce rate per 1.000 population rose by nearly 74% within the same time period (from 0,5 to 1,9). Furthermore, all over Europe the proportion of marriages ending in divorce is rising and reaches 40% in Northern Europe. The EU (15) average of extramarital births as a percentage of live births rose from 5,1% to 28,4% between 1960 and 2000. Here again, Northern countries exhibit the highest rates, whereas the rates are relatively low in Southern Europe. In 2000, in the EU (15), on average 10% of children aged 0-14 lived in families with only one adult (as a proportion of all children of that age in families). Here again, the proportion was the highest in the Northern countries (up to 20%) and the lowest in Southern Europe (2,8% in Spain, for example). Nevertheless, lone parenthood is not always a stable state, but rather forms a stage of life. In the UK, for example, in about 50% of cases, lone parenthood has a duration of four years or less. It is important to note that on average in the EU (15), 90% of single parents are female (c.f. Hantrais, 2004). This evolution of family models in Europe shows the rising importance for family policies to cater to the needs of different family types. Each European country has national or local organisations that offer support specifically for single parents. Lump sum

cash benefits represent the main part of governments' support for single parents with an objective of minimising child poverty. Nevertheless, supporting the employment of lone parents, mothers in most cases, still plays a secondary role in many European countries. In Germany, for example, single mothers are particularly penalised by the fact that all-day child care facilities are hardly available and affordable, especially for children under three years of age (c.f. Fagnani, 2001). Nevertheless, for the purpose of clarity, I do not give details about family policy instruments dedicated to lone parents only.

To understand the impact of family policy instruments on the labour supply decisions of mothers in a conventional family structure, it is useful to have a look at the mechanism of intra-household decision making. This is why, before presenting empirical results, the next section provides an overview of theoretical arguments that explain labour supply decisions of married women and the impact of family policy instruments.

### **1.2.1. Theoretical background: female labour supply in a microeconomic framework**

There exists no single model of reference which explains the labour supply of married women living with a partner. Several theoretical and empirical investigations add up to an overall picture.

#### Traditional approach: unitary framework

The traditional approach by Samuelson (1956) considers the household as a homogenous unity that behaves exactly like one single agent: The spouses have identical preferences and share a pooled income. A two-member household ( $i, j$ ) allocates consumption  $x$  and leisure  $l$  by maximising a common and unitary utility function:

$$U(x_i, l_i, x_j, l_j)$$

which is subject to a joint budget constraint. The rationality principle implies an optimal arbitrage between consumption (paid in working hours) and leisure. Goods are bought at price  $p$  and leisure is bought at price  $w$ , which means that the price of leisure is the opportunity cost of labour. The solution yields a household's goods demand and labour supply. Hence, a household's labour supply is a function of preferences, wages and prices.

Policy instruments that reduce income, like taxes, affect the household's labour supply in two ways: The household may increase its labour supply in order to avoid consumption restrictions (income effect). The household may also lower its labour supply because the wage reduction caused by taxes implies that the price of leisure falls (substitution effect). The standard unitary model can not predict which effect dominates. Furthermore, the model does not take into account intra-household choices, as the couple is reduced to a single economic agent (black box). Hence, the unitary framework can not clarify labour divisions and resource distributions between spouses and consequently can not distinguish between gender-specific impacts of policy instruments on the two spouses.

To correct for the problems and shortcomings of the neoclassical unitary framework, new models of intra-household decision making were created that follow the concept of methodological individualism. These models help to understand gender-specific issues of intra-household decision making, such as the distribution of resources and the division of labour between spouses.

### Intra-household decision models

Intra-household decision models take into account the individual preferences of each spouse. A household's behaviour results from the spouses' individual rational choices, which implies that there exist two separate individual utility functions. The individual utility functions of the spouses can represent egoism (c.f. Manser and Brown, 1980), care (c.f. Becker, 1973, 1974) or altruism (c.f. MacElroy and Horney, 1981). Egoistic individuals maximise their own utility function, whereas the utility of caring individuals depends not only on its own level of consumption and leisure, but also on the utility of the other members of the household. The utility of altruistic individuals depends on its own level of consumption and leisure as well as of the other household member's level of consumption and leisure. Caring and altruistic preferences imply a larger transfer of resources within the household.

It is assumed that marriage brings an utility gain for both spouses. For egoistic individuals, this gain can come from economies of scale and access to public goods. For caring or altruistic individuals, there may also be a gain from household production (meals, children, prestige, cf. Becker, 1973) and affection (love, health, the joy of sharing leisure time, cf. Hammermesh, 2000). The utility gain is shared between the spouses according to a predetermined rule. Spouses break up if they could increase their utility outside marriage. The break up "threat" makes it possible for both spouses to bargain with one another.

### *Cooperative bargaining models*

Cooperative bargaining models assume that the labour supply of each spouse is based on a cooperative bargaining procedure between spouses. Each spouse maximises his/her utility function subject to a joint budget constraint. The “threat point”, known from game theory (Nash, 1953) is the outcome of each spouse at non-cooperation, which can occur in the case of divorce. Manser and Brown (1980) model divorce-threat Nash-bargaining for egoistic individuals, and McElroy and Horney (1981) do so for altruistic individuals. The threat-point can also be the outcome at non-cooperation within marriage (Ludberg and Pollak, 1993, 1994). It is assumed that the negotiated distribution of gains and division of labour between spouses is Pareto-efficient.

The collective approach by Chiappori (1988, 1992) also suggests a cooperative decision making process in which the spouses collectively take Pareto-efficient decisions. Yet, in contrast to the aforementioned cooperative bargaining models, the collective approach does not assume a Nash-equilibrium bargaining rule, but a predetermined sharing rule. Also in this model, the individual maximises his or her utility (dependent on leisure and consumption) subject to a joint budget constraint which is determined by both spouses' wages and non-labour income. Chiappori (1998, 1992) proves theoretically that the negotiated outcome, which is each spouse's labour supply, is Pareto-efficient, dependent on the individual preferences (egoism, care or altruism).

### *Non-cooperative bargaining models*

The labour supply of each spouse can also be interpreted as a strategy based on a Nash-equilibrium of a non-cooperative negotiation game. In a repeated game, the spouses turn off course in case of divergent interests that fail to be reconciled. Bourguignon (1984), focussing on labour supply, shows that the non-cooperative solution leads to a Cournot-Nash equilibrium, in which each individual maximises his utility subject to the joint budget constraint and to the time constraint given the behaviour of the other member. Lundberg and Pollak (1994) further add that the joint budget constraint can be divided in individual budget constraints, depending on the individual's own resources and the voluntary contributions of the other household member. In this case, the threat point within marriage is the refusal of contribution.

In all these models, the household is modelled as a pair of individuals with distinct utility functions who arrive at a Pareto-efficient allocation of individual consumption and labour supplies. In the Pareto-efficient equilibrium, each household member provides goods that

reflect the negotiated responsibilities to the family and adopts a labour supply decision according to the negotiated division of labour.

Yet the models do not explain what determines the negotiated equilibrium of contributions. Further approaches are necessary to arrive at a framework that is able to explain differences in the negotiated contributions between spouses.

Apps and Rees (1997) extend Chiappori's collective approach by adding domestic production, supposing that time not spent in the labour market is used not only for leisure as assumed by Becker (1965). Without domestic production, a rise in wage of individual  $i$  only has an income effect on individual  $j$ . With domestic production, a rise in wage of individual  $i$  also has a substitution effect on individual  $j$ : individual  $i$ 's higher wage implies a rise in the price of his time at home, which raises the implicit price of domestic goods produced by individual  $i$ . Hence, wage differences between spouses cause substitution among production by each individual: if individual  $i$ 's wage for paid labour is higher than individual  $j$ 's wage, individual  $i$  will work less in domestic production, and individual  $j$  will compensate this by reducing his time spent in the labour market. This is how gender specific wage differences lead to a gender-specific division of labour within the household. Empirically, husbands tend to work more in paid labour and wives tend to work more in household production. Traditional norms may reinforce the specialisation of gender roles within the household (c.f. Lundberg and Pollak, 1993). Cigno (1990) emphasises that gender specific production advantages play a role, too. A women's relative production advantage in domestic labour would lead to a division of labour even in the case of wage equality between spouses.

In addition, Apps and Rees (1997) highlight that Chiappori's model does not provide for the possibility of non-participation in the labour market. It can be assumed that an individual does not participate in the labour market as long as its wage is under the reservation wage (a wage at which the agent is exactly indifferent between working and not working). Taking into account the possibility of non-participation, an empirical study by Blundell, Chiappori, Magnac and Meghir (2006) analyses the labour supply variations of spouses due to their partner's income variation. The analysis is based on United Kingdom survey data from 1978 to 2001. They find out that the labour elasticities are in general not symmetric among spouses: the wife's labour supply tends to vary inversely with her husband's wage. Unemployment of husbands leads to an increase in the wife's labour supply (added-worker effect, c.f. Serneels, 2002) and an increase in the husband's wage lowers a woman's labour supply, as predicted by Apps and Rees' (1997) model (income effect). Yet, conversely this is not the case: the empirical analysis shows that the husband's labour choice can be

considered as discrete: either, he works full time or he doesn't work at all, independent of his wife's wage. Further empirical analysis by Knowles (2007), based on US-households in the years from 1965 to 2000, confirms that even in times of increasing working hours and wages of women, the labour supply of married men does not decrease. However, recent studies (c.f. Neimann, 2008; Killingsworth, 2008; Soobedar; 2008) detect that with women's rising labour market participation and wage income, there is a higher possibility that spouses take their employment decisions simultaneously (mutual interdependency between spouses labour supply decisions).

Blundell et al. (2006) show that a woman's labour supply also varies with her own wage. Women do not participate in the labour market as long as their wage stays under the costs of working, which is the price of an externalisation of domestic work (costs of childcare, housework...) (c.f. Cigno, 1990). Furthermore, an increase in a woman's wage increases her opportunity cost of staying at home and consequently increases her labour supply (substitution effect).

The husband's rigid labour supply and the wife's high labour supply elasticity reflect a gender-specific division of labour with the men as principal earner and the women as second earner of the household. The division of labour and the resulting income differences between spouses are Pareto-optimal. This equilibrium is independent of the predetermined "sharing rule" of gains between the spouses, which is why Chiappori (1988, 1992) makes no particular assumptions about the sharing rule. In general, it is assumed that the household's decisions concerning the assignment of expenditures are independent from who receives the income within the household (Beckerian "income pooling"). However, the household members may agree to pool income in a joint account but the spending from this may depend on who is earning the money (c.f. Bonke and Browning, 2008). As the individual's income share impacts its bargaining power, it is possible that the bargaining power in turn determines the intra-household resource distribution. The bargaining power of individual  $i$  is determined by the relative share of resources lost for individual  $j$  if individual  $i$  goes away (c.f. Orsini and Spadaro, 2005). Hence, it can be assumed that the gender-specific division of labour has negative consequences for the second earner's intra-household bargaining power, and as a result, household resources are unequally shared among spouses.

Le Cacheux (2005) emphasises the fact that bargaining models fail to explain intra-household resource distribution. This makes it difficult to analyse the impact of policy instruments on labour supply decisions. Furthermore, Le Cacheux (2005) stresses that the presented models do not take into account the fact that women's labour supply may also

vary with labour market constraints (involuntary unemployment, selectivity bias). To investigate the impact of policies on intra-household choices with respect to labour supply and resource distribution, micro-simulation models can be useful. Yet, so far these models no not sufficiently take into account the interaction between reform impacts on intra-household resource distribution and reform impacts on the spouses' labour supplies.

Finally, what can we say about the impact of policy instruments on female labour supply? First of all, a socio-fiscal system can re-allocate resources within a household by attributing non-labour income to individuals. Thus, public transfers can lower gender-specific income differences and therefore raise the second earner's (mostly women's) bargaining power in the household (c.f. Orsini and Spadaro, 2005). On the other hand, public transfers lower women's labour supply due to an income effect (c.f. Blundell et al., 2006; Agarwal, 1997). This, in turn, lowers women's bargaining power (c.f. Orsini and Spadaro, 2005). Blundell et al. (2006) emphasise that policies that encourage female labour market participation significantly improve women's relative welfare within the household, whereas public transfers to households can make women worse off. Hence, in order to rebalance bargaining power between spouses, a socio-fiscal system should focus on encouraging female employment by reducing gender-specific wage differences.

The analysis so far supposes that child benefits (lump sum cash benefits, parental leave benefits...) lower female labour supply due to an income effect. To analyse the impact of a joint tax system on female labour supply, one has to take into account the marginal effective tax rates. The base of the joint tax system is the household income as a whole. Households enjoy an advantage from joint tax splitting only if one spouse is in a higher tax bracket than the other. The higher the spouses' income difference and the higher the progressivity of the tax system, the higher is the tax relief for the couple. This raises the bargaining power of the second earner. Yet, an increase in income of the women as second earner lowers the tax relief of the household. Consequently, the joint tax system implies a higher marginal effective tax rate for the second earner in comparison to an individual tax system. We have seen that the labour supply elasticity with regard to the wage of the second earner is higher than of the principal earner. Accordingly, the labour supply elasticity of the second earner with regard to marginal tax rates is higher than of the principal earner (c.f. Hausman, 1981). Hence, it is likely that a joint tax system discourages female employment (c.f. Orsini and Spadaro, 2005). Child care subsidies and costs reliefs for childcare lower women's costs of working and therefore are supposed to encourage female employment (c.f. Cigno, 1990; Jaumotte, 2003).

A series of empirical studies (c.f. Blundell et al., 2006; Cherchye and Vermeulen, 2003; Knowles, 2007) reject the unitary approach and strongly favour the collective approach of intra-household decision making. Nevertheless, until recently many countries' transfer and benefit system takes into account only the resource allocation of a household as a whole, especially when the poverty reduction of children is on the agenda. In these cases, policy makers assume an equitable sharing of resources within the household and neglect impacts of tax and benefits on women's labour supply decisions (c.f. Agarwal, 1997). The analysis so far suggests that improving the well being of households as a whole may come at the cost of an increase in gender-specific disparities within a household (c.f. Le Cacheux, 2005). This underlines the importance of considering intra-household decision making processes.

### **1.2.2. The impact of the child benefit and family tax system on mothers' labour market participation**

In all 27 European countries, the main family instrument that aims to compensate for the costs of having children are family benefits in cash, complemented by tax breaks. On average, these benefits represent around 60 % of total « family/children » expenditures and 1.2 % of GDP. There are large discrepancies between countries in cash benefits, ranging from 0,2% of GDP in Spain up to 2,7% in Luxembourg. Apart from Luxembourg, cash benefits are also very high in Austria, Germany, Belgium and France. Nordic countries, Latvia, Lithuania, Portugal, Italy and Spain are below the average (ESSPROS data, EU (27), 2005). Child benefits are mainly paid as lump-sum benefits per child regardless of the level of family income, but they can vary with the age of the children. Furthermore, child benefits are not conditioned on the use of, for example, childcare services. In most countries, there are additional child benefits targeted at particular situations like large families, low income families, disabled children or lone parents, which will not be discussed here. Child benefits aim to reduce child poverty, but can lower female labour market participation. Périvier (2004) and Jaumotte (2003) highlight that generous lump-sum child benefits weaken the incentive to work for the second earner of a couple (mostly mothers) due to an income effect.

Moreover, also the tax system affects parental labour market decisions including working time patterns. Most EU countries have individualised tax systems, but nearly all countries have some forms of tax relief either for spouses or for children. In France, for example, there is a joint family tax system (*quotient familial*) that takes into account the number of children. In Germany, married couples benefit from tax reliefs independent of the presence of children

(*Ehegattensplitting*).<sup>39</sup> The progressivity of European tax schedules implies that in all countries with family tax systems, the household's tax relief is higher the larger the household income and the larger the income disparities between spouses. Women as second earners are confronted with a high effective marginal tax rate, because a rise in women's labour supply leads to a withdrawal of tax credits and benefits on the basis of total family income (c.f. Apps and Rees, 2008). Due to the high labour supply elasticity of second earners, family tax systems discourage the labour supply of married women (c.f. Jaumotte, 2003).

### **1.2.3. The impact of parental leave on mothers' labour market participation**

There are various forms of family-related leave systems across Europe. Depending on the scheme, parental leave can make it easier for parents to continue working or to get back into employment after a break, but it can also worsen the difficulties faced by some parents, mainly mothers, in trying to keep a job or in returning to employment. Leave schemes may also accentuate career discontinuity, which is most prevalent among mothers. In such cases, parental leave may, ultimately, undermine rather than promote gender equality at work, at home and in the family by reinforcing women taking on a greater share of parenting duties.

Cash benefits for family related leave (income maintenance benefit at childbirth, parental leave benefit, birth grants) represent on average 0,3% of GDP in the 27 European countries. Nordic countries, Estonia, the Czech Republic, Latvia, Hungary and Romania are the countries reporting a larger proportion of GDP to these kinds of benefits (up to 0.7% of GDP in Sweden, for example) (ESSPROS data, EU (27), 2005). Other forms of family related leave are maternity and paternity leave and leave to care for children in special circumstances like illness, disability, an emergency situation etc.

Concerning parental leave, which is the main element of family related leave, the types open to parents vary widely across countries. Based on the year 2004 and with respect to payment, we can distinguish between two groups of countries: In the first group, parental leave is paid as a percentage of the former wage (for example in Denmark, Norway, Sweden, Finland, Germany from 2007 on, Slovenia). In the second group, parental leave compensation is a flat rate allowance (for example in Ireland, UK, Spain, Austria, Hungary, Slovakia, Italy, Belgium, Luxembourg, Germany up to 2007, France).

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<sup>39</sup> More on France's and Germany's family tax system in the second section of this chapter.

With respect to the duration of parental leave, two clusters of countries may be identified: in the first one, the combined duration of maternity and parental leave is not more than one year (for example in Belgium, Italy, Luxembourg, Denmark, Norway, Slovenia, Germany since 2007) whereas in the second cluster, parental leave provides longer support up to three years (for example in Austria, Finland, France, Germany until 2004, Hungary, Poland, Spain, Sweden, Slovakia).

A third point to consider is the fathers' entitlement to share part of the parental leave, splitting countries in two groups, one group where fathers are encouraged to take part of the parental leave (Denmark, Finland, Norway, Sweden, Portugal, Austria, Germany since 2007) and another group where fathers are not particularly addressed.

Deven and Moss (1999, 2002a, 2002b, 2005) raise the question of parental leave being a progress or a pitfall for mothers with respect to work. They point out that the impact of parental leaves on women's employment widely depends on the characteristics of the scheme - in terms of duration, level of compensation, flexibility and provisions for sharing by the two parents. Parental leave can promote mothers' labour supply when it offers adequate conditions for a break in working trajectory. However, if the leave scheme is too long or not flexible, parents - in practice mothers - may be less likely to return to work. Long parental leaves (more than one year) can damage a mother's ability to return back to work and to continue a career, as emphasised by Piketty (2005) and Thévenon (2007). They show that the 36 months - parental leave period in France significantly raises mothers' withdrawals from the labour market, especially for low educated women obtaining low wages.

In order to reduce the work penalty for women for taking leaves, policies in Scandinavia, Portugal, Austria and, more recently, in Germany, have attempted to get more fathers taking up parental leaves by reserving some paid weeks of leave for their use. Fathers' use of parental leave largely depend on the level of compensation: in countries where the compensation is a rate of the former wage, like in Denmark, Finland, Norway, Sweden and recently Germany, more fathers are likely to take up leave. Though, even when compensation is high, fathers' take-up rates stay significantly lower than mothers'.

Furthermore, gender pay disparities and cultural values also explain take up disparities between fathers and mothers. For instance in Hungary and Slovakia, traditional family organisation appears to be the main barrier to fathers' participation in family life (c.f. Math and Meiland, 2004). In Spain, little is done to foster greater sharing of parenting and domestic duties and to tackle a prevailing male-dominated culture. In France, fathers'

reluctance to take up paternity leave stems from their disapproval of the idea of stopping work for caring a child, viewing the new approach to child-rearing as too far from their values regarding fathers and mothers roles in the raising of children (c.f. Gregory and Miller, 2008; Math and Meiland, 2004). Finally, the impact of parental leave on women's employment depends also on further contextual factors such as the availability and accessibility of childcare facilities, women's working conditions and their possibility of tailoring job and work schedules (c.f. Pfau-Effinger and Geissler, 2005; Math and Meiland, 2004).

#### **1.2.4. The impact of policies supporting childcare on mothers' labour market participation**

Family benefits in kind mainly include benefits that are aimed at providing child day care to families. These benefits represent 0.6 % of GDP on average in the EU (27), with up to 2.2 % in Denmark (ESSPROS data, EU (27), 2005). Nordic countries differ from other European countries by spending much more on in-kind benefits than others. Since the 1990s onwards in most EU countries, policy makers are increasingly concerned by developing early and affordable childcare facilities and pre-school education in order to facilitate parents' employment as required by the Lisbon employment strategy and the Barcelona targets.

Childcare costs hinder many mothers to engage in paid work. Apps and Rees (2008) highlight that gender differences in labour supply are partly driven by the hourly cost of the care of a dependent child. As childcare costs indirectly reduce a mother's net wage, these costs are analogous to a tax on the woman's wage. The resulting lower wage is a disincentive for mothers to work. Yet, not only childcare costs, but also restricted opening hours of childcare facilities hinder mothers' work effort. In some countries like the South European countries, mothers' labour market participation depends largely on informal childcare arrangements with relatives, neighbours, or other family members (c.f. Moss, 2007; Lewis, 2006).

Perraudeau and Pucci (2007) discuss the effect of childcare costs on mothers' labour supply by focussing on the trade off between work and care. Their analysis is based on choice models for the potential second earner in which the trade off is related to costs (wage versus childcare costs). Perraudeau and Pucci (2007) find out that on the one side, mothers' labour supply varies according to various facts between countries, as the number and age of children, the measurement of childcare costs or the work context, but on the other side, in all countries the costs of childcare and the level of cost compensation play an important role on

mothers' decision to participate in the labour market. Informal childcare by family members becomes more attractive when the costs of formal childcare are high (c.f. Flippo and Sedillot, 2000).

Chaupain-Guillot et al. (2007) model mothers' simultaneous decisions relating to childcare and labour supply. They estimate that in many EU member states including Germany, the UK, the Netherlands and Southern European countries, childcare constraints remain particularly high, which negatively impacts mothers' employment. In these countries, childcare coverage is low, especially among the 0-3 years old. Though many 3-6 years old children participate in pre-school programs, these programs are not always full time and the demand is not satisfied. This implies that mothers of young children have to reduce their working time to care for the children themselves. Consequently, in these countries mothers have to choose between work reduction and work cessation. Nordic countries began earlier than other West European countries to develop formal high quality public childcare structures, including extended pre-school and school hours. The child care policy of the Nordic countries is an important part of their policy model supporting the combination of work and family responsibilities (c.f. also Jonsson and Letablier, 2005; Moss, 2007). Central and East European countries (NMS) used to have an extended system of public childcare. Since the countries' transition to a market economy, especially in Poland, Hungary and Estonia, childcare facilities are on the decline, which reduces mothers' labour market participation (c.f. also IPROSEC research network 2003 and 2004). In France, the dual system of free pre-school (*ecoles maternelles*) for children aged 3 to 6, in which every child has the right to a place, and childcare support for younger children (crèches, nannies, childminders) appears to contribute to a relatively high labour market participation rate for mothers, especially for mothers with children above 3 years old. However, although the system combines collective structures and private (subsidised) childcare, the demand for collective structures is not fully satisfied.

Whether the State provides public collective childcare or subsidises private childcare (childminders, nannies), the impact on women's employment is positive since childcare costs are reduced in both cases. In fact, as noticed by the OECD (2007), both demand and supply-side funding can be effective in achieving reconciliation goals as long as only good quality care is supported, not only in terms of opening hours, health and safety dimensions but also with respect to child development objectives (pedagogical components). Though parents often praise the higher quality of public collective structures in comparison to childminders, individual forms of childcare may be preferred by working parents over collective structures because of greater flexibility regarding atypical hours of work (c.f. Eydoux and Letablier,

2008). On the other hand, parents who have to pay a childminder are often faced with higher costs in comparison to public child care. In countries with area-wide public child care services it is attractive for parents to engage in paid work. In countries where little public childcare support is available, childcare costs for parents may be substantial. According to OECD (2007) calculations, after accounting for income-tested childcare support, out-of-pocket childcare costs exceed 20% of the net income of a dual earner family with full-time earnings of 167% of the average wage in Ireland and the UK. Childcare costs are above 40% of a family budget of a lone parent with 66% of the average wage in Ireland. Consequently, in Ireland and the UK, the costs of childcare may be so high that work may not pay for many mothers. The importance of public investments in childcare must therefore not be underestimated, especially for low income families and lone parents. Public support to extra school hours or to leisure time care services is also an important issue with respect to mothers' labour market participation and employment patterns. Denmark and Sweden and to a lesser extent France have developed a system of extra school childcare organised by municipalities, using existing public infra structures (mainly school buildings) for the purpose of delivering such services (c.f. OECD, 2007).

#### **1.2.5. The overall impact of family policies on mothers' labour market participation**

Del Boca et al. (2007) attempt to access the role of a whole set of family policies (childcare arrangements, parental leave, family allowances) on women's decision towards labour supply. Their research based on the European Household panel (ECHP) indicates that the differences in women's labour market participation attributed to family policies differs according to women's educational levels and thereby women's (potential) income levels. Childcare facilities, family allowances and parental leave regimes have more impact on participation decisions for low educated women than for qualified women.

Several researches highlight that effective family policies with regard to mothers' employment assist parents in the reconciliation of work and family life (for instance, Daly, 2000; Gornick and Meyers, 2006; OECD, 2007). However, only some countries, especially the Nordic countries, pursue a universal comprehensive approach of supporting such reconciliation, whereas other European countries tend to restrict spending and to target their support to low income families.

Numerous typologies have been produced to map the relationships between mothers' labour market participation and policies supporting parenthood (for instance: Gornick and Meyers, 2006; De Hénau et al., 2004; Hantrais, 2004; Thévenon, 2006; Da Roit and Sabatinelli, 2007; Chaupain-Guillot et al., 2008). Using the ECHP data for the year 2000, Chaupain-Guillot et al. (2008) distinguish four clusters of countries in the EU(15) to which a fifth group may be added:

In the first cluster of countries (France, Austria, Finland and until 2007 Germany), parental leave is a major dimension of reconciliation policy since in these countries, the duration of parental leave is longer than in the other EU countries. It is paid with reference to mothers' caring activity instead to wage replacement. More over, in these countries there exist relatively generous lump-sum child benefits. For a mother with three children, the lump-sum child benefits represent around one third of the average wage of women. The focus of family related expenditures on low income families reflects the welfare tradition of equalising living conditions for children in order to evade poverty. Yet, a raise in income reduces family benefits and tax reliefs, which discourages mothers as second earners to come back into the labour market. Hence, a weak position of women in the labour market results (c.f. also OECD, 2007).

In the second cluster (Denmark and Sweden), childcare facilities are the major dimension of reconciliation policy and the proportion of parents using childcare facilities is the highest among EU (15) countries. The duration of parental leave is shorter than in the first cluster of countries. At the same time, in Denmark and Sweden, mothers' labour market participation is relatively high (more than 80%). Ellingsaeter and Leira (2006) add that Denmark and Sweden invest more in care and early education services for young children, whereas Finland and Norway focus public resources more on supporting parents providing home care for very young children. Nevertheless, the family support system of Nordic countries is consistent and coherent. The high priority of childcare policies reflects the objective of supporting mothers' work and care balance (c.f. also Börnberg, 2007).

Greece, Spain and Portugal form a third cluster in which policies supporting parenthood and the labour market participation of mothers are limited, except in Portugal. Italy is not included in this cluster because of a more generous system of parental leave, lump-sum child benefits and childcare facilities.

In the fourth group (Belgium, Ireland, Italy, Luxembourg, the Netherlands and the UK), mothers' participation in the labour market is relatively high, but often part-time, and children enrolment in preschool at the age of 4 is slightly higher than in the other EU member states.

The typology of Chaupain-Guillot et al. (2008) does not include the 12 new member states. These countries are likely to form a fifth cluster (cf. Hantrais, 2004), which is characterised by a "re-familisation" of the family –policy relationship. An underfunded reconciliation policy makes working parents increasingly dependent on family and kinship solidarities since access to childcare facilities is becoming too expensive for most parents.

### **1.3. Conclusion**

Since the 1990s, in most EU (15) member states mothers' employment has increased substantially, but their working time patterns continue to vary widely across countries. Furthermore, in the 2000s in all 27 EU member states, women with children are less likely to be in employment than women without children. The motherhood-induced employment gap has negative consequences on income, career opportunities and access to social security benefits for mothers. These losses can be interpreted as indirect costs of having children and may significantly impact women's fertility decisions.

The analysis has shown that family policies play an important role in mothers' employment, but not all of them encourage mothers to work. Long parental leave durations and generous lump-sum child benefits and tax allowance lower the incentive to work for a couple's second earner. This concerns especially low qualified women. In contrast, child care facilities encourage the reconciliation of mothers' work and family life.

Furthermore, we have seen that the impact of family policies on mothers' employment varies widely across countries. Even within a country it is possible that family policy instruments differ with respect to the impact on mothers' employment. This is due to the fact that in many countries, family policy aims to achieve a variety of often incompatible objectives with regard to mothers' employment, fertility and reduction of child poverty. However, more and more countries accept the idea that family policies supporting reconciliation of paid work and family life are not only beneficial for mothers' self-interest, but are also beneficial for the society as a whole, as they can raise fertility and lower children's poverty. Consequently, reconciliation policies are on many national agendas throughout the European Union and in some countries, family policy shifts have been huge in recent years. This goes especially for

Germany, where the recent reform of parental leave reflects the country's willingness to support mothers' employment. However, opposing incentive effects of Germany's tax and benefit system for families and the insufficient childcare infrastructure undermine the purpose of the reform. It becomes clear that focusing on single policy measures is not enough to effectively encourage mothers' labour market participation.

The analysis so far points out the difficulties encountered in assessing the overall effectiveness of family policies. The impact of family policies on female employment needs to be examined on the basis of a holistic approach. To identify and compare the overall effectiveness of a country's whole range of family policies on mothers' participation in the labour market, a more detailed knowledge of the policy instruments and the composition of the society is necessary. This also includes knowledge about a country's values concerning gender roles, motherhood and parenting, about its conceptualisation of children's education and its political and societal contexts. A comparative analysis based on all 27 European countries can hardly offer a holistic approach. This is why in the next section I propose a detailed case study that focuses only on two countries, which are Germany and France.

When comparing the overall impact of family policies on mothers' labour market participation for all 27 European countries, Germany and France are classified in the same cluster (section 1.2.5.), mainly because of their relatively generous lump-sum child benefits. Nevertheless, mother's employment patterns and fertility behaviour vary largely between the two countries. This supports the statement that a closer look in the form of a case study is necessary.

## **2. Case study: The impact of financial assistance to families on mothers' labour market participation in Germany and France<sup>40</sup>**

Numerous articles on family politics in Europe focus on a comparison between France and Germany.<sup>41</sup> Despite a general similarity of their respective socio-economic systems, these two countries display very different levels of fertility and female labour market participation. On the one hand, there has been a massive entrance of women into the labour market since the 1970s, and today women's global employment rate is around 60% in both countries.<sup>42</sup> On the other hand, fertility rates in Germany average 1.3 children per woman aged between 14 and 49 years, much lower than in France, where this figure is approximately 1.9.<sup>43</sup> The greatest differential exists for university degree-holding women between the age of 35 and 40: in Germany, 40% of these women are childless, whereas in France this figure is only 24%.<sup>44</sup> Furthermore, female employment has developed very differently in the two countries: in Germany, it consists, to a larger extent, of part-time work and precarious employment; 39% of German female employment is part-time, versus only 24% in France.<sup>45</sup> Concerning part-time work, the contrast between the two countries is greatest between mothers. The percentage of part-time working mothers whose youngest child is below the age of six is 46% in Germany, opposed to 23% in France. Moreover, the percentage for employed mothers working part-time, whose youngest child is between the ages of six and fourteen, is 59% in Germany opposed to 28% in France.

Many studies seek to explain these differences in fertility rates and the sheer volume of female labour between these neighbouring countries. Fagnani (2001), for example, emphasises the importance of norms and values related to education and child-rearing. Germany long considered familial responsibilities as a private matter. France, on the other hand, has a long tradition of institutionalised family politics. These different approaches are exemplified in childcare infrastructure. In France, supply of childcare is a lot more developed than in Germany, despite of the fact that the supply of childcare for very young children (between the ages of zero and three) still can be ameliorated. In Germany, there is a lack of child care centres and nurseries compared to France, and opening hours are not adapted to full-time employment within the entire age range of children. Since the turn of the century, Germany has realised the importance of enabling a reconciliation of professional and family

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<sup>40</sup>Section 2 based on a publication under my maiden name : Greulich, A. (2008): "Aides et Compensations Fiscales pour Familles en France et en Allemagne. Où se fait la Différence ? Quelles Réformes à Envisager ?" Centre d'Analyse Stratégique. *Horizons Stratégiques* n°7.

<sup>41</sup> See, for example, « Politique Familiale : la France et l'Allemagne divergent. » *Espace Social Européen* N° 845, march 2008.

<sup>42</sup> Eurostat (2006).

<sup>43</sup> INSEE (2006).

<sup>44</sup> Statistisches Bundesamt (2003).

<sup>45</sup> Eurostat/ EU Labour Force Survey (2003).

life and has endeavoured to improve its childcare system in accordance with the recommendations of the Lisbon guidelines.

Yet, the gap between the volume of female labour (in terms of absolute labour supply and in terms of hours of work) in France and Germany supposes that the influence of norms and family values is not limited to the system of childcare but extends more widely, for example to the system of financial assistance to families. In effect, the financial support which parents receive in accordance to family policies differs to a great extent between these countries. Though, as the total volume of financial support to families is comparable in Germany and France<sup>46</sup>, the divergent effects of financial support are less documented compared to the effects of childcare supply, and thus risk being underestimated.

My analysis checks the following hypothesis: the lesser extent of female labour (measured in hours) in Germany versus France is in non negligible parts due to the principles which underlie the system of financial support for families in each country, which differ greatly. In Germany, family policies have long encouraged the traditional family, with a principal breadwinner. A detailed analysis will show that even today, a part of financial support to families in Germany encourages mothers to stay at home. It may be that this incentive is due to the fact that the high lump-sum family benefits in Germany are detrimental to investment expenditures designed to reconcile professional and family life.

In France, on contrary, it has become socially acceptable for mothers to work full-time. It is therefore likely that the French system of financial support to families seeks to encourage conciliation between work and family life, and provides more incentives for women to work, even though in France lump-sum family benefits are also relatively generous in comparison to other European countries.

This section presents a deep analysis of the main instruments of state financial support to families in France and Germany by taking into account redistributive effects as well as effects on women's labour supply decision. Firstly, this article offers a comparative description of cash benefits to families by taking into account different family norms and values in the two countries. The presented cash benefits are lump sum benefits per child, parental leave benefits, child care cost reductions and tax reductions due to the family tax system. Secondly, this article highlights the redistributive effects of the family transfer and tax compensation systems in France and Germany. Thirdly, this article analyses the overall effects of these instruments on providing an incentive for women to work. I show that while in

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<sup>46</sup> They both approximate the European average in 2005 (source: Eurostat).

France, the dominant objective of all instruments of financial assistance to families is the reconciliation between work and family life, the priorities of financial assistance to families set by Germany are less coherent. Thirdly, I discuss potential reforms of financial assistance to families in both countries, focussing on the family tax system.

## **2.1. Instruments of financial assistance to families in Germany and France**

The different instruments of financial assistance to families in Germany and France can be thought of in four categories: classic instruments, instruments related to parental leave, instruments related to childcare, and instruments related to taxation of family income. The following description is limited to these four main family policy devices which are basically devoted to families representing the conventional model, that is a married couple with children.

The limitation is made in order to give a compact overview on family policies and in order to assess the impact on female employment in Germany and France more easily. However, one must note that Germany and France provide specific financial assistance to lone parents, which reflects the fact that in both countries, the traditional family structure is on the decline. In 2008, in West Germany about a quarter and in East Germany more than half of all children are born to unmarried mothers. In France, the percentage comes to 42,6%. Around 10% of children aged 0-14 live in families with only one adult (as a proportion of all children of that age in families) in France, which means that 90% of children are reported to be living with two parents, irrespective of whether the two parents are both the biological parents. In Germany, one fifth of all households with children have single parents<sup>47</sup>. The financial support for single parents offered by France and Germany mostly consists of lump sum cash benefits in order to prevent children of lone parents from poverty. For the purpose of clarity, I do not give details of these measures<sup>48</sup>. Nevertheless, it may be pointed out that the lack of area-wide all-day child care facilities, especially in Germany, penalises lone mothers in particular.

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<sup>47</sup> Data for Germany: Statistisches Bundesamt; data for France: INED (Institut National des Etudes Démographiques)

<sup>48</sup> Apart from financial assistance to lone parents, there are other special forms of family assistance that will not be discussed here for the purpose of clarity. For example, France has a back-to-school aid as well as a fixed tax reduction for education expenses.

### 2.1.1. Classic instruments

Table 26 in the appendix indicates the principal elements of classic instruments of financial assistance to families in Germany and France. In both cases, lump-sum benefits based on the number of children constitutes the key element of family benefits.

In Germany, parents face a choice between tax allowances and a lump-sum benefit per child (*Kindergeld*). The former case includes tax allowance for children (*Kinderfreibetrag*) and, since 2000, tax allowance for children related expenses (*Betreuungsfreibetrag*). These two tax allowances are cumulative and depend on taxable income. To choose between the lump-sum benefit per child (*Kindergeld*) and tax allowances, the fiscal administration automatically applies the more favourable system to each household (*Günstigerprüfung*). Tax allowances are only valid if the lump-sum benefit per child does not have the effect of full tax exemption. This eventuality only applies to very high-income households, who have a higher marginal tax rate.<sup>49</sup> A study by Baclet, Dell and Wrohlich (2007) estimates that only 17% of households with children are subject to child tax allowance in Germany. In contrast to France, lump-sum child benefit in Germany is not indexed to annual inflation. In 2005, these benefits totalled in expenditures of around 35 billion euros (c.f. Rosenschon, 2006). The amount paid per child has been rising in a continuous fashion since the 1990s. In 2005, child tax allowances caused tax losses of 1.5 billion euros.

In France, lump-sum benefits per child (*allocation familiale*) are granted independently of household income, just as in Germany, but do not co-exist with tax allowances. In direct comparison to Germany, the lump-sum benefits in France are less generous than those in Germany, not only in terms of actual amounts but also because they are only effective from the second child onwards. Furthermore, the age limit for children is lower in France.<sup>50</sup> Therefore, total expenditure on financial assistance to families is lower in France (12 billion euros in 2005).<sup>51</sup> However, as in Germany, the amount paid per child has been rising in a continuous fashion since the 1990s. Nevertheless, in the two countries lump-sum benefits are relatively generous in comparison to other European countries, as discussed in the first section of this chapter.

<sup>49</sup> The coexistence of tax allowance and lump-sum child benefit (*Kindergeld and Freibeträge*) is due to the fact that the German Constitution (1949) forbids taxation of a certain minimum living allowance for families with children. As a consequence, a tax allowance for children was initiated in 1983, without ending the regime of lump sum child benefit that existed since 1975. The current amounts are valid since January 2002.

<sup>50</sup> In France, the applicable age limit is twenty. In Germany, the age limit was reduced from 27 to 25 in 2007 (children pursuing education).

<sup>51</sup> 11.95 billion € according to CNAF (2007).

In addition, both countries pay a premium for low-income households with children. While the child premium in Germany (*Kinderzuschlag*) is aimed at reducing child poverty, the French equivalent (*complément familial*) rather aims to support large families, independently of income: it is reserved for families with at least three children aged above three years. Furthermore, there exists a further lump-sum benefit for large families (*allocation forfaitaire pour familles nombreuses*) which has very specific requirements and therefore only a marginal impact.<sup>52</sup>

With lump-sum benefits per child, both Germany and France mainly seek to reduce family poverty (c.f. L'Hommeau and Paupy, 2001, for a discussion of France), but the two countries emphasise different further aims. In France, the absence of lump-sum benefits paid to single-child households reflects the intention to primarily help large families (horizontal redistribution). In Germany, the lump-sum benefits allocated per child start with the firstborn and are generally more generous, which favours low-income households (vertical redistribution). Moreover, total expenditure on lump-sum family benefits are three times higher in Germany. This generosity supposes that Germany, more so than France, seeks to support families with a principal breadwinner.

### **2.1.2. Instruments related to parental leave**

Table 27 in the appendix illustrates the main instruments related to parental leave. Concerning parental aid, the German system recently underwent reform. Before 2007, there was a benefit for rearing children (*Erziehungsgeld*) which consisted of a fixed amount of 300 Euros per month for duration of two years.<sup>53</sup> This duration had been continuously increased since 1979. Its main beneficiaries were stay-at-home mothers, since it was conditional on a certain income ceiling and even part-time employment would reduce the benefit significantly.

For children born during or after January 2007, the new parental leave benefit (*Elterngeld*), inspired by Scandinavian countries, brought about profound changes. The declared goal of this reform is to diminish income losses, to shorten the duration of parental leave for mothers and to provide an incentive for fathers to go on parental leave (c.f. Spiess and Wrohlich, 2006). Parental leave benefit was thenceforth augmented and indexed to previous earnings, but the duration of these payments was reduced. The parent temporarily abstaining from work in order to take care of the baby receives his/her previous salary at a replacement rate

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<sup>52</sup> This fixed premium concerns families with 3 three children, of which one lives at home at the age of 20 and is paid until that child turns 21. This helps alleviate the fall in financial assistance to large families, which has occurred because it is limited to the age of twenty.

<sup>53</sup> Respectively, 450 € for a duration of one year.

of 67%.<sup>54</sup> The amount is computed on the basis of the average monthly income of the last twelve months before maternity leave (*Mutterschutz*).<sup>55</sup> The maximum amount is 1800 Euros per month. The minimum amount (300 euros per month) is designated towards parents who have not previously been employed.

Unlike the prior regulation, there is no income ceiling, but the amounts allocated are limited to a duration of only 12 months<sup>56</sup> (14 months in the case of a single parent). In order to encourage fathers to go on parental leave, the duration is extended to fourteen months if the other parent is also taking a leave of at least 2 months. This type of benefit has to be requested during the official “paternal leave period” (*Elternzeit*). This is the period that assures that the parent can return to his/her job, which has a duration of three years after the childbirth.

A parent reducing his/her hours worked (i.e. working part-time) in order to take care of the child receives reduced parental leave benefit (*reduziertes Elterngeld*) which rises to 67% of the difference between previous full-time earnings and the current part-time salary. Parents can totally split childcare by each working no more than thirty hours a week.

According to estimations of the Germany's Family Ministry, the new parental aid scheme costs an additional billion euros per years, as compared to the previous system (*Erziehungsgeld*), which cost 3.15 billion euros in 2005.

France has also reformed its system of parental leave benefits. The main changes are; firstly, an extension of parental leave benefits to families with only one child, and secondly, a rise in the level of benefits for parents working part-time. The new PAJE (*Prestation d'Accueil du jeune enfant*) is valid for all children born after January 2004. It replaces all benefits related to infancy which were effective before 2004, i.e. APJE (*allocation pour jeune enfant*), AAD (*allocation d'adoption*), APE (*allocation parentale d'éducation*), AFEAMA (*aide à l'emploi d'une assistante maternelle agréée*) and AGED (*allocation de garde d'enfant à domicile*).

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<sup>54</sup> With two children aged below three years and three children aged below six years, this parental benefit substitutes 73.7% of net earnings (Geschwisterbonus de 10%). In case of multiple births, parental leave benefit includes an additional 300€ per month per additional child. In case of low income, parental aid can be up to 100% of net earnings. In case of the birth of a second child within two years of the birth of the first child, the earnings substitution is based on the salary received before the birth of the first child (“speed premium”).

<sup>55</sup> In both countries, there is also maternity leave. In Germany, maternity leave (*Mutterschutz*) lasts for six weeks before and eight weeks after giving birth. In France, the duration of maternity leave (*congé de maternité*) is 16 weeks in total with the possibility of choosing the distribution of these weeks. France differs from Germany in that it gives fathers the possibility of benefiting from eleven days of work leave during the 4 months after a child is born.

<sup>56</sup> By reducing this amount by half, it can be paid for a duration twice as long.

PAJE consists of four elements: a premium allocated at birth or adoption, the baseline benefit, a supplement for free activity choice (*complément du libre choix d'activité*) and a supplement for free choice of childcare (*complément du libre choix du mode de garde*) (the latter will be outlined in the next section). For the premium allocated at birth or adoption and for the baseline benefit, there exists an income ceiling which is rather high. The baseline benefit is payable during the first three years after birth/adoption and is not cumulative with respect to family supplements. During those three years, the right to return to one's previous job is guaranteed.

The supplement for free activity choice (*complément du libre choix d'activité*) seeks to allow parents to interrupt, be it totally or partially, their professional activity in order to care for children younger than three years of age (c.f. "l'essentiel" No. 52 – CNAF, august 2006). It is directed at parents who were employed during the two years prior to their child's arrival. As a result, it excludes anybody with a discontinuous career path – such parents are only eligible for the premium allocated at birth or adoption and the baseline benefit. Furthermore, the supplement for free activity choice (*complément du libre choix d'activité*) presents a higher benefit level than the former plan for parents working part-time. This implies a valuation of part-time employment relative to ceasing work entirely. Furthermore, the maximum payable amount was raised by 37%. On the other hand, the required conditions for previous employment were tightened. With several children, the supplement for free activity choice (*complément du libre choix d'activité*) is paid during three years beginning with the arrival of the child. According to the new regulation, parents with only child can also receive this payment, but its maximum duration is limited to six months after the arrival of the child.

In order to shorten the duration of payment, France has instigated an optional supplement for free activity choice (COLCA – *complément optionnel de libre choix d'activité*), given to parents who are caring for at least three children and who are interrupting their career for one year after the child's arrival. This type of supplement awards higher payments for a duration that is shorter.<sup>57</sup>

According to the French family benefits office CNAF (Caisse Nationale d'Allocations Familiales), the first three elements of PAJE brought about expenditures of 3.9 billion Euros in 2005. That same year, the corresponding former allocation schemes (APJE, AAD and APE) still brought about expenditures of 2.55 million euros. The sum of these expenditures (6.45 billion euros) is 1.5 times higher than that estimated for parental leave benefit in Germany (*Elterngeld*) in 2007.

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<sup>57</sup> 758, 95 €/month without the baseline benefit and 587, 90 €/month with the baseline benefit for one year.

With these new schemes in place, Germany and France are seeking to make returning to work more attractive to mothers. Yet in France, the principal schemes related to parental leave have basically remained the same. Germany, on the other hand, has undertaken deeper reforms, thereby demonstrating a real will to change the behaviour of parents. By shortening the duration of parental benefit, German mothers are effectively obliged to start working again sooner and German fathers have an incentive to go on paternal leave. Furthermore, the new German regulation diminishes the loss of transfer payments due to part-time employment, which reduces the incentive to completely stop working.

The reforms led by the German government are mainly benefiting high-income households. Since parental leave benefit (*Elterngeld*) is computed on the basis of previous earnings, these reforms predominantly support university degree-holding mothers with high incomes (c.f. Schönberg and Ludsteck, 2007). The new regulation is less favourable towards mothers with no or low income as the duration of payment is reduced (from 2 years to 12 or 14 months). The new parental benefit (*Elterngeld*) therefore is less conducive to vertical redistribution.

The reform suggests that Germany is starting to promote other family models than that of one principal earner (male breadwinner). On the other hand, this reform, by the way in which it substitutes salaries, encourages degree-holding women to leave the labour market more so than before, and discourages women from having children in the early phase of their career since eligibility for parental leave benefit (*Elterngeld*) requires successful professional integration. Therefore, despite the progressive character of this reform, its effects on young mothers' employment and fertility patterns remain to be seen.

In France, the reforms related to *PAJE* favour higher income households since the income ceilings and the amounts awarded in connection to a reduction of hours worked were increased, while those related to completely stopping work were left unchanged. According to a study by Marchal (2007), high income families tend to work less, while medium income households rather choose to stop work completely. Revaluing part-time employment relative to complete work cessation in this manner was primarily intended to make returning to work more attractive to mothers. On the other hand, the new parental benefit schemes are a lot less progressive than those introduced in Germany. Especially for low qualified mothers with more than one child, France's payment duration of 36 months, considered quite long, risks delaying mothers' return to the labour market. In addition, fathers are not explicitly addressed by these new schemes unlike in Germany.

### 2.1.3. Financial assistance reducing the cost of child care

Table 28 in the appendix presents the main instruments of financial assistance reducing the cost of child care. In Germany, a new regulation covering the cost of child care by providing tax deductibility of child care costs (*Absetzbarkeit Kinderbetreuungskosten*) was introduced in 2006. Previously, working couples (i.e. when both are working) could reduce their tax duty by 1500 euros a year when cost of child care exceeded 1548 euros. The new regulation raised the ceiling for child care expenses. Now, lone working parents and working couples can reduce their tax duties by two thirds of child care costs, from the first euro up to 4000 euros per year. The new German scheme also allows tax allowances by two thirds of child care costs for lone non-working parents or couples where only one partner is employed. However, for them, the age limit is stricter. All types of child care (cribs, kindergarten and nannies) are included in this measure. In contrast to France, the fiscal treatment in Germany thus does not depend on the mode of child care. The German finance minister foresaw a loss of fiscal revenue amounting to 0.46 billion euros per year from 2006 onwards because of these new measures.

In France, parents choose between the free activity choice supplement (redemption of salary losses incurred when reducing or stopping employment: *complément du libre choix d'activité*) and the supplement for free choice of childcare (for parents in full-time employment: *complément du libre choix du mode de garde*).<sup>58</sup> The latter seeks to grant parents a more free choice of child care and takes account of more important child care fees than previously (c.f. "l'essentiel" No. 36 – CNAF, april 2005). If parents employ a childminder or a nanny, the supplement for free choice of childcare (*complément du libre choix du mode de garde*) covers the social security contributions and a part of the net salary. When a childminder (childcare at childminder's house: *assistante maternelle*) is employed, all social security contributions are covered by 100% (exemption from employers and employees contributions). In the case of a nanny (childcare at parents' house: *garde à domicile*), 50% of social security contributions are covered up to a limit of 402 Euros per month (the maximum amounts can vary depending on the child age). For both types of child care, a minimum of 15% of the care taker's salary is left to be paid by the parents. The supplement for free choice of childcare (*complément du libre choix du mode de garde*) seeks to blur the choice between employing a childminder or a nanny.<sup>59</sup>

<sup>58</sup> The accumulation is possible given part-time employment and having a paid child minder.

<sup>59</sup> Previously, employing a child minder was supported by AFEAMA (*aide à la famille pour l'emploi d'une assistante maternelle agréée*) and was favoured relative to employing a nanny, which was supported by AGED (*allocation de garde d'enfant à domicile*), because AFEAMA covered parts of the net salary and AGED did not.

If parents don't employ a care taker themselves but instead use an association or a company which employs child minders or nannies, they receive higher allowances, since social security payments are not covered. In the case of child care by a registered child minder (*assistante maternelle agréée*) parents receive a lump sum per child. In the case of a nanny (*garde à domicile*), parents receive a fixed sum regardless of the number of children. Again, in all cases, parents are left to pay at least 15% of these expenditures.

According to CNAF, the supplement for free choice of childcare (*complément du libre choix du mode de garde*) amounted to expenditures of 1.33 billion Euros in 2005.<sup>60</sup> The corresponding former schemes, AFEAMA and AGED, still entailed expenditure of 1.7 billion Euros that same year. Together, they made up 3.03 billion Euros of government expenditure – almost seven times the amount planned for reducing child care costs in Germany in 2006.

In Germany, the tax deductibility of child care costs (*Absetzbarkeit Kinderbetreuungskosten*) helps active parents and reflects the political will to improve the possibility of reconciling work and family life. Nonetheless, the costs of these measure are a lot lower than in France, whether one is looking at total government expenditure/loss of fiscal revenue for child care cost coverage or coverage per family. Despite a well-meaning reform, in Germany financial support to working parents by covering child care costs is thus limited compared to France.

#### **2.1.4. Taxation of family income**

Like France, Germany takes the existence of families into account across the entire range of income taxation. But the compensation of family expenses in the case of taxation of household income differs in important ways between the two countries, as illustrated in table 29.

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<sup>60</sup> In France, the supplement for free choice of childcare is applicable only to children up to the age of six only. However, since January 2006, a tax deduction of child care costs is also possible, regardless of the type of child care (home-based or not) and the age of the child ("service à la personne"). This deduction is subject to an income ceiling. Parents can pay the registered child minder, the respective association or the nanny in CESU-cheques (*cheque employ service universel*). They receive a tax certificate which allows them to benefit from a tax reduction.

**Table 29: Taxation of family income in Germany and France, 2007**

Germany	France
<b><i>married couple's tax splitting (Ehegattensplitting)</i></b>	<b><i>family tax splitting (quotient familial)</i></b>
joint taxation with income splitting (tax reduction not limited)	joint taxation with income splitting (limited tax reduction)
splitting divisor ( <i>Splittingfaktor</i> ) : 2 for a married couple  does not take into account the number of children !	splitting divisor: 2 for a married couple without children  plus 0,5 for the first child  plus 0,5 for the second child  plus an additional part for every further child

Data Germany: january 2007; data France: mai 2007,  
 Sources : BMFSFJ (Bundesministerium für Familie, Senioren, Frauen und Jugend) 2007, CNAF (Caisse nationale d'allocations familiales) 2007, MISSOC (Mutual Information System on Social Protection) 2006.

In Germany, there's a married couple's tax splitting (*Ehegattensplitting*), a tax system in which husband and wife each pay income tax on half the total of their combined incomes. In order to calculate the amount of tax, the taxable income of both spouses is summed and divided by two (*Splittingfaktor* 2: slitting divisor, number of shares). Finally the tax rate schedule is applied to both halves for each spouse and the resulting amount is added to the common tax duty (no income ceiling). The number of children is not taken into account by the calculation. The married couple's tax splitting (*Ehegattensplitting*) is the second most expensive instrument of German family policy (following lump-sum child benefit: *Kindergeld*); according to the federal government, it amounted to 19.1 billion Euros in 2005.

In France, the family tax splitting (*quotient familial*) takes into account the number of children below the age of 18, which constitutes one of the main differences between the two countries' family policies. The splitting divisor (number of shares) rises with the number of children and the resulting amount of tax resulting from this divided income is multiplied by the number of shares. The family tax splitting (*quotient familial*) is subject to an income ceiling which varies according to the family's situation. But as the ceiling is very high, most families do benefit from this family tax splitting in France.<sup>61</sup> Courtioux, Laib, Le Minez and Mirouse (2004) use a micro-model to estimate that family tax savings due to the family tax splitting reached 11 billion Euros in 2004.

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<sup>61</sup> German parents can actually choose between the married couple's tax splitting (*Ehegattensplitting*) and individual taxation, which is not possible for French families. In order to benefit from the tax splittingt, Germans have to be married. In France, couples registered for a civil solidarity pact (PACS) are eligible for the family tax splitting as well. However, the French family tax splitting also applies to single parents (with a different calculation of shares), while in Germany there are tax exemptions for single parents.

Because the tax schedule in both countries is progressive, both the German and the French tax splitting system favour couples with only one salary or markedly dissimilar salaries. For such couples, both splitting systems slow the incremental increase of the tax rate and thereby cause a rise in deductions. It therefore seems that both the married couple's tax splitting (introduced in Germany in 1958) and the family tax splitting (introduced in France in 1945) are derived from a traditional family model with a sole or main breadwinner. Furthermore, both splitting systems imply a rise in tax savings with total family income.

## **2.2. Impacts of financial assistance to families**

### **2.2.1. Redistributive impacts**

In order to evaluate the redistributive effects of the overall system of financial assistance to families in France and in Germany, I first compare total expenses in each country. Their volume varies depending on the sources. Effectively, the calculations often take account of more elements than the four main instruments listed above. These elements are mainly redistribution schemes for low income persons which vary according to the family situation, such as expenditures for housing, disabilities, precariousness and social security. Most data coming from OECD, Eurostat or national data sources unanimously indicate that the total expenditures of financial family assistance have been continuously rising since the early nineties in both countries. In Germany, these expenditures were at a lower level than in France at the beginning of the 1990s, thereafter, they rose more quickly in a catching-up manner. Expenditures on families have been converging in the two countries in the last couple of years and stood at around 3% of GDP in both countries in 2005 (Eurostat). At this level, Germany and France represent the European Union average.<sup>62</sup> Tax reductions for families occupy a large share of "family expenditure" in both countries - around 1% of GDP in Germany and 0.8% of GDP in France.<sup>63</sup> This represents around 30 billion Euros in Germany per year, of which 19 billion are spent on the married couple's tax splitting (*Ehegattensplitting*). In France, the total amount of tax reductions for families stands at 18 billion Euros per year, of which 11 billion are spent on the family tax splitting (*quotient familial*).

However, this conformity in the volume of government expenditure for families in terms of GDP does not imply that family policies in the two countries are aimed at similar objectives. A comparison of the relative amounts attributed to each of the four main instruments reveals marked contrasts, which reflect very different goals. In Germany, expenditure on families has

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<sup>62</sup> Eurostat (2006).

<sup>63</sup> OECD Social Expenditure Database (2003).

risen since 1990 mainly because of the high level lump-sum child benefit (*Kindergeld*). With an amount of 35 billion Euros in 2005, these fixed payments constitute the main instrument of financial support to families in Germany, aimed at protecting families from poverty (vertical redistribution). Moreover, the high lump-sum child benefit seeks to offset the effect of the married couple's tax splitting (*Ehegattensplitting*), which favours high-income households and thus weakens the intended vertical redistribution. At a cost of 19 billion Euros in 2005, the married couple's tax splitting (*Ehegattensplitting*) is the second most expensive of German family policy. The two main instruments of financial support for families thus have opposite redistributive effects. The way in which this contradiction is tolerated assumes that family policy favours the shared effect of these two main instruments, which is to support families with a sole or main breadwinner.

The recent reforms of parental leave benefit (*Elterngeld*) and of tax deductibility of child care costs (*Absetzbarkeit Kinderbetreuungskosten*) in Germany signal that policy is distancing itself from the traditional model of the family. By supporting working couples and single working parents more than before, the new parental leave benefit (*Elterngeld*) encourages a conciliation of work and family life. To obtain this aim, the German state accepted the anti-redistributive character of parental leave benefit (*Elterngeld*), which substitutes previous earnings by 67% subject to a rather high income ceiling (1800 Euros per month). Hence, the losers of this reform are poor or low-income parents including students. Prior to the reform, they received 300 Euros per month for a duration of 24 months. The reform implies a shortening of this duration to 12 or 14 months. Despite the progressive character of the reform of parental leave and the coverage of child care costs, the expenditures related to these instruments, around 4.2 billion Euros for parental leave benefit (*Elterngeld*) and 460 million Euros for tax deductibility of child care costs (*Absetzbarkeit Kinderbetreuungskosten*) for the year 2007, don't compare well to those expenditures related to lump-sum child benefits (*Kindergeld*) and the married couple's tax splitting (*Ehegattensplitting*) mentioned before. Thus, these reforms cannot be interpreted as a radical change away from the dominant principles of family politics. The reforms rather represent first signs of greater open-mindedness on part of German politicians. It is therefore likely that these reforms will have a medium-run impact on the behaviour of parents: their resort to parental leave benefit (*Elterngeld*) and to tax deductibility of child care costs (*Absetzbarkeit Kinderbetreuungskosten*) costs will probably pick up only in the next years, so that the financial volume of these instruments will increase.

In France, the two main instruments of financial assistance to families – in terms of expenditure volume – are the family tax splitting (*quotient familial*) (approximately 11 billion

Euros annually) and the sump-sum child benefit (*allocation familiale*) (approximately 12 billion Euros per year). The family tax splitting (*quotient familial*) seeks to provide relief to large families by taking the number of children into account and by attributing an entire supplement to each child from the third child onwards. At the same time, the family tax splitting (*quotient familial*) favours high-income families and working couples which great earnings disparity. As a result, it implies horizontal redistribution, all the while encouraging a traditional, principal breadwinner model of the family. Of course, the lump-sum child benefit (*allocation familiale*) aims to prevent families from entering poverty, but it also works in a manner conforming to the family tax splitting's objective of horizontal redistribution by taking effect only from the second child onwards. The expenditures related to parental leave benefit (around 6.5 billion Euros in 2005 for: premium allocated at birth or adoption, baseline benefit, supplement for free activity choice: *complément du libre choix d'activité*), and coverage of child care costs (around 3 billion Euros in 2005 for the supplement for free choice of childcare: *complément du libre choix du mode de garde*), which are designed to reconcile work and family life, seem less significant by comparison to the former two instruments. Nonetheless, the absolute amount invested in reconciling work and family life is twice as high in France as in Germany.<sup>64</sup>

A study by Bacet, Dell and Wrohlich (2007) uses a micro-simulation taking into account the two countries' respective income distributions and tax schedules to confirm the notion that the system of financial assistance to families in Germany places greater emphasis on vertical redistribution. The French system, on the other hand, is effectively more oriented towards horizontal redistribution. As a result, families who raise their income suffer greater financial losses in Germany than in France. This assumes that the two systems of financial support for families also differ concerning employment incentives for women.

### **2.2.2. The impact on women's labour market participation**

In Germany as in France, the socio-fiscal system (transfer payments and tax schedules) gives rise to an income redistribution from high-income to poorer households. This implies that when a household's gross income is high, financial support stagnates or diminishes and deductions rise more than proportionately. As vertical redistribution is stronger in Germany than in France, it may be that the overall socio-fiscal system in Germany is more progressive as well. This would imply that the effective marginal income tax rate is higher in Germany than in France.

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<sup>64</sup> In France, instruments related to parental leave and coverage of child care costs add up to 9.5 billion euros (6.5 billion euros + 3 billion euros). In Germany, these instruments add up to almost 5 billion euros (4.2 billion euros + 460 million euros).

These different progressivities cause different labour supply incentives in the two countries. The more progressive a fiscal system is, the lower is the incentive to raise one's labour supply. Many empirical studies such as Hausman (1981) assume that the labour supply elasticity with regard to effective marginal tax rates of the second earner within a household is higher than that of the household's principal earner. In the majority of cases, a progressive socio-fiscal system is therefore less conducive to the employment of women relative to that of men within a couple.

Math (2004) analyses the progressivity of France and Germany's respective socio-fiscal systems and their incentive effect on a household's second earner's labour supply decision, i.e. women in most cases. In order to indicate the progression of each country's socio-fiscal system, Math computes an effective implicit marginal tax rate (IMTR) based on data from 2001. This rate represents the additional part of gross income resulting from a rise in labour supply that is not transferred into an additional part in net income because of deductions and transfer losses. The IMTR takes taxes into account social security contributions, elements of financial assistance to families, housing aid and benefits which reduce the costs of health care and education. The IMTR is computed for various types of households, which are differentiated according to their size (couples or single persons, number of children) and their income level.

The IMTR is estimated for three transitions concerning the employment of women (rises in women's labour supply) within a couple. It is based on the assumption that men, being the principal earners, work full time and that they earn the average income of men working full-time.

The first transition is that of women within a couple from not working to working part-time. This model assumes that female part-time employment earns the full-time minimum wage in France and half the average full-time salary of women in Germany.<sup>65</sup>

The model's second transition is a move from not working at all to full-time employment. The model assumes that women in both countries earn women's average salary when they move to such full-time employment.

The third transition is a move from part-time to full-time employment. The model assumes that a woman's earning thereafter rise from earning minimum full-time wage in France and

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<sup>65</sup> This is due to the fact that there is no legal minimum wage in Germany.

half the women's average full-time earnings in Germany to earning the full average salary for women in both countries.

Table 30 shows the calculated IMTR for each of the three transitions in France and Germany.

**Table 30: Effective implicit marginal tax rate (IMTR) in % for three activity transitions of married women in Germany and France, 2001**

	Germany	France
1) inactivity → part-time	50	33-40
2) inactivity → full time	51	33-41
3) part-time → full time	53	23-44

Source: Math (2004)

For Germany, the model generates a IMTR which is always independent of the number of children. In France, the IMTR depends on the number of children for each transition. It is low for couples with three children and couples with no children. Couples with one child of preschool age are at a disadvantage because of the rise in expenses compared to childless couples and because financial support is weaker than for large families (couples with only one child have no lump sum child benefits -*allocation familiale*-, for example).

For all three transitions, the IMTR is higher in Germany than in France. This confirms a systematically higher progressivity of the German socio-economic system. Consequently, the financial work incentives for women living in couples are lower than in France regardless of the size of the household. In Germany, persons with three children and persons without children wishing to move from working part-time to working full-time are face a IMTR at least twice as high as in France. For all household sizes, the German IMTR is higher for transitions to full-time employment than for transitions to part-time employment. This isn't always the case in France. The transition to full-time employment is thus penalised in Germany relative to a move to part-time employment. This contributes to the fact that female employment in Germany consists, to a large extent, of part-time work (39% in Germany vs. 24% in France).<sup>66</sup>

Social security contributions and tax schedules are similar in the two countries. The difference in IMTRs is thus largely due to divergent effects of fiscal benefits and tax compensations for families. Among these, the incentive effects of the married couple's tax

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<sup>66</sup> Eurostat (2003).

splitting (*Ehegattensplitting*) in Germany and the family tax splitting (*quotient familial*) in France play special roles. As both tax splitting systems tend to favor households in which there exists a great earnings disparity between spouses, they reduce the financial incentives for the second earner's (i.e. usually women) labour supply decision. The difference between Germany's married couple's tax splitting and France's family tax splitting is that the latter takes the number of children into consideration. In France, tax reductions related to the family tax splitting rise with the number of children: this helps to explain (to a considerable extent), why the IMTR facing a mother deciding to initiate or increase her labour supply is lower in France than in Germany. As a result, the German socio-fiscal system induces families to follow the traditional model with a single or principal breadwinner more so than in France.

Based on 2001 figures, the study by Math (2004) does not consider the recent reforms concerning parental leave and coverage of child care costs in both countries, that is to say, the parental allowance (*Elterngeld*) as well as the tax deductibility of child care costs (Absetzbarkeit Betreuungskosten) in Germany and PAJE in France.

The work of Spiess and Wrohlich (2006) on reforms of parental leave benefits in Germany (*Elterngeld*) conclude that shortening their duration provides an incentive for mothers to return to work sooner. The authors estimate that employment of mothers with children aged two will rise from 36% to 40% on average. In addition, this measure encourages fathers to go on paternity leave. This alleviates mothers' burden of domestic chores and encourages them to be employed. During the first nine months of 2007, 37.140 fathers - correspondingly 9.6% of total demand for parental leave benefits (*Elterngeld*) - chose to go on paternity leave.<sup>67</sup> Of these, 41.1% chose to stop working for a duration between three and twelve months.<sup>68</sup> In march 2008, 12,1% of the persons drawing parental leave benefits (*Elterngeld*) were fathers. 77% of them were active before the birth of their child. 63% of them stopped working for only two months.<sup>69</sup> Hence, despite a positive tendency, it is still mainly women who are reducing or ceasing their work for a longer time period after the arrival of a child. It remains to be seen if the new parental allowance in Germany really induces a change of paradigm.

In France, the free activity choice supplement (*complément du libre choix d'activité*) makes a reduction of work more attractive than total cessation. Due to this supplement, mothers who were employed in low-paid jobs before the arrival of their child dispose of a similar income as before when reducing their hours worked by three quarters. Marcial (2007) shows that the

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<sup>67</sup> Statistisches Bundesamt (2007).

<sup>68</sup> BMFSFJ (2007).

<sup>69</sup> Statistisches Bundesamt (2008).

PAJE has incurred a decline in the number of mothers who stop working completely relative to those who reduce their hours worked in 2004. On the other hand, it's conceivable that the long duration of payment for mothers having more than one child (36 months) delays their return to work. Schönberg and Ludsteck (2007) show that this was the case in Germany before 2007, when the old parental allowance (*Erziehungsgeld*) paid out fixed amounts for a duration of 24 months.

To complete the analysis, Marc (2004) show that the working conditions of women (as in status/position, type of contract, working hours, salary, career perspectives) play a particular role in deciding – or not – to restart employment after going on maternity leave. If these conditions are not taken into account, the impact of financial assistance to families on mothers' decision to stop working risks being overestimated.

Concerning child care costs, the supplement for free choice of childcare in France (*complément du libre choix du mode de garde*) represents a higher level of financial support than in Germany, where this support derives from the tax deductibility of child care costs (*Absetzbarkeit Kinderbetreuungskosten*). This results in more mothers working full-time in France than in Germany. Furthermore, in France only full-time employed mothers are entitled to coverage of child care costs. In Germany, parents who reduce or cease their labour supply not only receive a substitution of their salary (parental leave benefit), but also some form of coverage of child care costs. This high level of financial support implies that, for women holding university degrees, reduction and cessation of work are more attractive options in Germany than in France. For women with low qualifications, reduction and cessation of work are more attractive options in France than in Germany because of the longer duration of financial support.

### **2.3. Potential reforms**

In both countries, recent reforms of financial assistance to families seek to encourage women to work. However, in both countries, some political debates revolve around reforms that constitute disincentives to female employment.

In Germany, the actual discussion of future reforms rather illustrates a return to old norms. In 2007, a large proportion of conservative policy decision-makers demanded a child care allowance (*Betreuungsgeld*)<sup>70</sup> of approximately 150 euros per month to non-employed

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<sup>70</sup> Critics have coined the term "stove prime" (*Herdprämie*) for this requested allowance.

parents of young children. This proposal seeks to compensate working and non-working parents equally: As working parents will benefit from planned government investments in child care centers, non-working parents would receive 150 euros per month to compensate them for looking after their children. This discussion hinders the development of progressive ideas which could advance female emancipation. Moreover, only recently the German government decided to increase the monthly lump-sum child benefit (*Kindergeld*) from 2009 on to 165 euros for the first and second child, to 170 euros for the third child and to 195 euros for the fourth and every further child in order to compensate families for rising living expenses. The political discussion abstracted completely away from possible disincentive effects for mothers' labour supply. Only isolated voices argued for investments in childcare instead of increasing child benefits by emphasising that the irreducible elevation per child (10 to 16 euros per month) would not be efficient to prevent families from income poverty.

In France, the system of welfare benefits for households with no or little income has recently been reformed. The reform does not particularly address married mothers with children, but is subject to criticism because of the expected negative impact on mothers' labour supply. Since May 2007, in 34 French departments the RSA (*revenu de solidarité active*) replaces the former welfare benefit for unemployed persons RMI (*revenu minimum d'insertion*). Its general introduction is foreseen for July 2009. The RSA will then be extended to replace the work premium for low income groups PPE (*prime pour l'emploi*), the benefit for sole parents API (*allocation de parent isolé*) and the benefit for specific solidarity ASS (*allocation de solidarité spécifique*) as well. The RSA aims at phasing out financial disincentives a person is facing when obtaining the RMI and wanting to take up work remunerated by the minimum wage (*SMIC*). The RSA is an income supplement for workers with low income and at the same time, it represents the welfare benefit for persons without income. Allège (2008) admits that the new RSA provides a higher incentive for inactive singles, especially for those who are low qualified, to take up work than the former RMI did. However, the RSI risks inducing secondary earners, typically married women with children, to reduce or stop working. Allège (2008) warns that the introduction of the RSA could have a perverse effect on the labour market, which is that the reduction of the labour supply by married mothers offsets the increase of the labour supply by low qualified singles. The global labour supply effect would then be negative. In fact, the RSA confronts secondary earners, who want to increase their labour supply, with a higher marginal tax rate than the RMI. This higher marginal tax rate represents a strong disincentive to work especially for secondary earners, because of their high labour supply elasticity. Piketty (1998) shows in an empirical analysis for France, based on household survey data from 1982 to 1997 (INSEE), that the labour supply elasticity of mothers with young children (in the function of second earners) is between 0,6 and 1,

whereas the labour supply of principal earners is quasi-inelastic. As a result, tax and benefit systems have a high impact on the labour supply of mothers, in a positive or negative way depending on the characteristics of the system, and hence, the RSA implies a strong disincentive for mothers, especially low qualified ones, to work. Eissa and Hoynes (1998) show for the USA that a reform similar to the RSA, namely the expansions of the EITC (earned income tax credit) between 1984 and 1996, has reduced the activity rate of women living in couple by 1 %. The EITC implies cash-transfers to lower-income families. Secondary earners of low qualification and hence low income are confronted with high marginal tax rates, especially in the phase-out of the EITC. Eissa and Hoynes (1998) conclude that the EITC reforms have effectively subsidised married mothers staying at home. Laroque and Salanié (2002) already warned that an introduction of tax credits in France similar to the american EITC, which they named ACR (*allocation compensatrice de revenu*), would have similar disincentives for mothers to work. In addition, Marc (2008) emphasises that in order to minimise mothers' disincentives to work, the costs as well as the non-monetary obstacles of return to work for mothers have to be reduced. Hence, to compensate the negative impact of the RSA, it is advisable to reduce child care costs and increase child care facilities.

The discussion of a child care allowance (*Betreuungsgeld*) and the child-benefit increase in Germany as well as the impending area-wide introduction of the RSA (*revenu de solidarité active*) suggest that in both countries, the declared will to promote women's employment sometimes takes a back seat. This is all the worse as in both countries, further reforms are necessary to encourage gender equality in the private as well as the professional sphere. Méda and Périvier (2007), for example, recommend for France streamlining the parental leave benefits so that parental leave is shorter and explicitly includes fathers<sup>71</sup>, paying 80% of earnings subject to an income ceiling. However, today, a big part in policy debate in Germany and France centers on the question how the tax system can make work for women with children more attractive. The following sections present three reforms which would significantly raise the incentive for women to work and which all constitute profound changes of the way families are taxed.

### **2.3.1. Adoption of the French family tax splitting in Germany**

The great differences between the incentive for women to work in France and Germany are, in large part, due to differences in the way in which families are taxed. Germany is one of the only countries in Europe not to take the number of children into account when taxing couples.

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<sup>71</sup> duration : 6 months for mothers and 6 months for fathers.

This begs the question of the effect of applying the French family tax splitting (*quotient familial*) in Germany. This effect was studied by Beblo, Beninger and Laisney in 2003. Since the French family tax splitting (*quotient familial*) implies lower effective marginal tax rates than the German married couple's tax splitting (*Ehegattensplitting*), the study assumes that adopting the family tax splitting in Germany would increase the incentive for mothers to work.

The economists base their assumptions on a micro simulation. In principle, this model computes a woman's potential income if the French family tax splitting was to be applied in Germany and estimates the potential change in women's labour supply in Germany. The model maintains the existing definition of taxable income in Germany. The analysis is based on data from the German SOEP (Socio-Economic Household Panel) of 1998, which includes individual data such as labour market status/position and income level of mothers. The model takes into account individual preferences (deterministic collective labour supply model, c.f. Chiappori, 1988, 1992) by estimating preference parameters for men and women in order to estimate their labour supply functions.

The study shows that applying the French family tax splitting in Germany would raise the potential income of women as "second earners". However, the total labour supply of women in terms of hours worked would not change. The potential effects rather emerge when differentiating between number of children and mothers' qualifications. Especially mothers with several children would benefit from a higher potential income. The incentive to increase one's labour supply would be highest for mothers with several children and having high qualifications. As a result, adopting the family tax splitting would encourage highly qualified mothers to combine professional and family life. Thus, adopting family tax splitting in Germany would tackle an important problem: In Germany today, qualified mothers do not supply more labour than those with low qualifications, on one hand, and the fertility rate is lowest for women holding university degrees (around 40% of degree-holding women in Germany between the ages of 35 and 40 are childless versus 24% of such women in France)<sup>72</sup>.

### 2.3.2. Individual taxation

Although the French family tax splitting (*quotient familial*) encourages mothers to work more than the German married couple's tax splitting (*Ehegattensplitting*), the French family tax splitting still has a negative impact on the labour supply decision of many women. That's why

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<sup>72</sup> Statistisches Bundesamt (2003).

Goldman and Sachs (2007) recommend introducing individual taxation not only in Germany but also in France, which would equalise effective marginal tax rates of men and women. This idea was first developed in the USA. Eissa and Hoynes (2002), for example, recommend basing the American EITC on individual earnings and not on family earnings in order to offset the incentive for secondary earners to leave the labour force.

A study by Callan, Dex, Smith and Vlasblom (2003) analyses the potential impact of individual taxation on labour supply of married women in Germany<sup>73</sup>. Their study supposes an adoption of the individual tax system that exists in Great Britain. The economists estimate the labour supply function of women in Germany, and then proceed by simulating hypothetical participation rates of women working part- and full-time within a regime of individual taxation. With the help of a bivariate probit model, based on women's utility functions, they estimate the probability of women participating in the labour market (choice between working and staying at home) as well as the probability of working full-time (choice between working part-time and working full-time). The model takes into account other exogenous variables such as salary, education and professional experience of women as well as the presence and age of children. The labour supply decision is determined by disposable after-tax income. The study concludes that applying individual taxation would hardly change the rate of part-time employment of married women in Germany. However, it would reduce women's rate of non-participation and would raise women's rate of full-time employment. In Western Germany, women's rate of non-participation would sink from 44.33% to 33.6% and women's rate of full-time employment would rise from 28.9% to 40.3%. In Eastern Germany, women's rate of non-participation would sink even further, from 16.1% to 2.3%, while women's rate of full-time employment would rise from 73.3% to 85.7%. These significant impacts plead in favor of individual taxation in Germany and suggest that this system would have similar positive effects in France. On the other hand, applying individual taxation would imply a great reduction in horizontal and vertical redistribution and would forsake the family character of the tax system, as emphasised by Hugounenq, Périvier and Sterdyniak (2002).

### **2.3.3. Gender specific taxation**

A study by Alesina et al. (2007) goes even further by suggesting taxation that is lower for women than for men. The idea, inspired by Akerlof (1978), assumes that income taxation should depend on non-modifiable characteristics which nevertheless influence income, such

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<sup>73</sup> Individual data are from the German Socio-Economic Household panel (GSOEP, 1991 and Eurostat, 1996).

as age or sex. The proposition to tax women less is derived from Optimal Taxation Theory, which implies reduced tax rates for persons with high labour supply elasticity.<sup>74</sup> Alesina et al. (2007) recommend to reduce income taxation for women and to increase income taxation for men in smaller increments, all the while lowering average tax rates. With such an optimal income tax, the labour supply of men will decrease by a lesser amount than that of women will rise. Thus, the overall labour supply would be higher and government fiscal revenues would not be diminished.

Gender based taxation would increase women's net earnings. As a result, this taxation system not only reduces behavioral distortions but also makes discrimination against women more costly for employers. Furthermore, such taxation would compensate women for the burdens of motherhood (career interruptions, among others). The authors emphasise that gender based taxation would not be unfair but could, quite to the contrary, encourage equality of men and women, most notably concerning access to the labour market and concerning the division of household tasks. It may be that a lower tax rate for women would reduce their labour supply elasticity while that of men would simultaneously rise. That situation would allow each sex to have the same marginal tax rates in the long run. Consequently, it would be possible to introduce identical tax rates for men and women in the long run.

## 2.4. Conclusion

Several studies emphasise that lower female employment and lower fertility rates in Germany than in France can be explained by a lack of institutionalised child care in Germany. This chapter shows that different norms concerning childrearing in the two countries are equally reflected in the systems of financial assistance to families. The effects of these differences in the systems should therefore not be underestimated.

With its high level of lump-sum child benefits (*Kindergeld*), Germany seeks to prevent families from living in poverty by emphasising vertical redistribution. Yet, the strong progressivity implied by the system of financial assistance to families has a negative impact on the labour supply of a household's second earner (mainly mothers). In France, the system of financial assistance to families favors large families (horizontal redistribution) more independently of the level of household income. This encourages highly educated women to work while raising their children at the same time. Recently, in view of an ensuing shortage of

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<sup>74</sup> Studies like Hausman (1981) have shown that the labour supply elasticity of women, who are often household's secondary earners, is higher than that of men, who tend to have a practically inelastic labour supply as principal earners.

qualified workers, Germany became aware of its incentive problem for qualified women to work. With the new parental leave benefit (*Elterngeld*) and tax deductibility of child care costs (*Absetzbarkeit der Kinderbetreuungskosten*), the German government has started supporting high-income mothers, which encourages them to have a career.

The French family tax splitting (*quotient familial*) and the German married couple's tax splitting (*Ehegattensplitting*) have a negative impact on the labour supply of women as secondary household earners. In both countries it would therefore seem useful to focus on potential reforms of the way families are taxed, one possible framework being individual taxation. Completely abolishing the family tax splitting and the married couple's tax splitting would certainly aggravate with immediate effect the financial situation of large families with large income disparities between the spouses and a relatively low total income. It is obvious that measures to reconcile family and professional life should not be applied in spite of children's well-being. However, such an abolition would free up enormous resources to compensate low-income families and large families.

In France, the free resources should be implemented to secure a better compensation of the cost of having a first child. Many family associations, for example "familles de France", estimate that the lack or the low levels of funding towards families with only one child represent one of the big shortcomings of French family policy. A better compensation of the cost of having a first child could contribute to reducing child poverty in France, which is observed to an increasing extent (c.f. Damon, 2007). Complementary, in France the free resources should be implemented to improve the supply of child care for children aged between zero and three years. Such an investment is necessary to allow freedom of choice of professional involvement and of type of childcare which is envisioned by the instruments of PAJE (c.f. Méda and Périvier, 2007). In Germany, freed-up resources should be used to facilitate reconciliation between family and professional life most notably by improving child care infrastructure for children of all ages.

Finally, to advance gender equality in the private as well as the professional sphere, it is advisable that France and Germany do not only focus on financial assistance to families and child care infrastructure. Encouraging female emancipation requires active policies in favor of women which are not limited to family policies. According to Jaumotte (2003) the best policies are those which do not only help women to reconcile family and professional life, but also liberate their career ambitions (equalising agents at work, for example).

## **Concluding Remarks**

This thesis shows that women's labour market participation, macroeconomic growth and family policies are closely linked to each other. Whereas there exists clear theoretical and empirical evidence that female labour market participation unambiguously promotes GDP growth, the inverse impact of GDP growth on female labour market participation is not as clear in the existing literature. Own empirical investigations prove that inversely, GDP growth first lowers female labour market participation and increases it in the middle and long run only. By empirically proving the validity of the "feminisation U" hypothesis, which implies a U-shaped (convex) pattern of female labour market participation along the economic development path, my empirical investigation closes a research gap. The finding implies several policy implications. As the impact of GDP growth on female labour market participation is ambiguous, it becomes clear that simply relying on macroeconomic growth is insufficient to promote female labour market participation. A policy which pursues this strategy not only risks restraining women's economic empowerment but also risks keeping a country's growth performance below its potential. Therefore, equalising institutions that promote women's labour market participation are necessary. A closer look on institutional settings in Europe shows that this goes not only for developing but also for industrialised countries. An investigation of the impact of family policy instruments on mothers' labour market participation in Europe and finds that not all family policies unambiguously encourage a reconciliation of work and family life. The redistributive character of several family policy instruments risks discouraging mothers' labour supply. Hence, it is essential to create a set of coherent family policy instruments that manage to simultaneously prevent families from income poverty while encouraging mothers' employment and fertility at the same time.

This is the essential conclusion of the present PhD thesis. Nevertheless, the analysis presented in the three chapters offers a series of further insights which are worth highlighting at this point.

Firstly, chapter 1 illustrates that the existing literature proves that gender equality in terms of education and labour market participation clearly promotes GDP growth. Today, this finding is recognised by many world bodies, like the World Bank or the UN for example, which take increasingly into account gender specific aspects when compiling their development aid programmes. In its report "Engendering Development" (2001), the World Bank states that women in the Middle East, North Africa, South Asia and Sub-Saharan Africa are most disadvantaged in terms of education and employment. The report emphasises furthermore that a reduction in gender discrimination is not just crucial for women themselves, but is also

meaningful in economic terms and hence for society as a whole. The World Bank suggests that yearly per-capita growth would have almost doubled in the past 30 years in many developing countries if more had been invested into the education and employment of women. The president of the World Bank acknowledged the scientifically proven fact that women's education and employment promotes growth at the forth Women's World Conference in Beijing in 1995 with the following African saying: "When we educate a boy, we educate a person. When we educate a girl, we educate an entire family and an entire nation." In order to reduce gender-specific discrimination in terms of education and income, the World Bank has decided to institutionalise a gender perspective in all of its development projects (gender mainstreaming) and projects are checked over to ensure that the needs of women are taken into consideration. In its report, the World Bank refers to a project in Morocco which illustrates why such consideration of women is important. A Moroccan village decided to invest in the building of streets and electricity, even though the nearest water source was five kilometres away. Women and girls are traditionally the ones who fetch water, and they often miss school to make long trips to the nearest well. The fact that no money was spent on building a well prevented girls from obtaining more schooling.

Nevertheless, the first chapter not only discusses the positive impact of women's economic empowerment on GDP growth, but also reveals a research gap by showing that the inverse impact of GDP growth on female labour market participation is not as clear in today's literature. Although several studies suggest a convex impact of GDP growth on female labour market participation ("feminisation U" hypothesis), they do not generally prove the validity of the hypothesis. This is due to the fact that the existing empirical investigations are based on time series or cross country data only and that they do not sufficiently take into account endogeneity problems.

Chapter two attends to this research gap, which is the missing empirical evidence of the validity of the "feminisation U" hypothesis. I empirically test the "feminisation U" hypothesis based on a newly available, large panel data set, combining time series and cross country data (184 countries, 1965-2004). This large data set allows taking into account endogeneity adequately. Furthermore, it allows testing for the robustness of the findings by using several specifications of the endogenous variable, female labour market participation. The presented estimation results prove a convex impact of GDP on female labour market participation. Yet, the analysis suggests that the U-shaped relationship is dominated by between-country variation. This finding is mainly due to the fact that the "feminisation U" can not be observed for single countries within the observed time period, which ranges over four decades only. This shows that further work is needed in the field of data collection and harmonisation. In

addition, chapter two also reveals that measurement and data availability problems limit the scope of interpretation. For example, it would be interesting to investigate the driving forces behind the convex impact of GDP on female labour market participation. For this purpose, it would make sense to investigate - as suggested by the theoretical framework - the impact of industrialisation and urbanisation on specific female employment patterns, for example part-time work of women with young children or female employment by sectors (formal, informal, agriculture, non-agriculture, blue-collar, white-collar etc...). It also would be interesting to estimate the impact of a nation's well being and its institutional setting on female labour market participation. Yet, in order to not significantly reduce the number of observations, it is necessary to stick to female labour market participation as endogenous and GDP as exogenous variable. This impediment reveals that more data collection is needed concerning more specific measures of female employment patterns, of welfare and of institutional settings, especially for developing countries. In addition, chapter two points out that even simple measures of female labour market participation are often not reliable, especially in developing countries, because of women's widespread informal economic activities which are not taken into account by official measures. Therefore, also concerning female labour market participation, data lacks and measurement problems need consideration.

Nevertheless, the empirical finding that macroeconomic growth lowers female labour market participation at early stages of development and increases it only in the middle and long run leads to an important policy implication: In order to increase female labour market participation, it is not sufficient to rely solely on the positive effects of growth, because they take effect very slowly and with delay. Gender promoting institutions are necessary, because economic growth may promote gender equality only with policy-makers' intervention. Policies that aspire to promote growth must ensure that the needs of women are taken into consideration. Creating decent and productive work for women, which adequately corresponds to women's specific needs, seems to be a major challenge in order to prevent women from dropping out of the labour market or getting stuck in low paid jobs in the informal economy with insufficient legal and social protection and a high degree of insecurity.

That this concerns not only developing countries, but countries of all development stages, reveals a closer look at the link between female employment, the presence of children and institutional settings in Europe. Chapter 3 addresses the issue of the impact of motherhood and family policies on female employment patterns, focussing on the European Union (27). The impact of family policies and the presence of children on female labour market participation is interesting especially for highly developed countries, because in these countries, women often have the same levels of education as men, and according to the

“feminisation U” hypothesis, these countries’ high levels of GDP should go hand in hand with high female employment rates close to those of men. Yet, a closer look reveals that in many industrialised countries, women’s labour market participation is still significantly lower than that of men, especially when looking at full-time equivalent employment rates of mothers with young children. Furthermore, the analysis shows that all over Europe, women, and especially mothers, are highly underrepresented in top management positions, research and politics. In Germany for example, 40,6% of the women (under 30) obtain the university qualification (“Abitur”) and at university there are as many women as men. But the German female activity rate in 2003 is only 66% comparing to the male activity rate of over 80%, and only 11% of the CEOs and only 6% of the university professors are women (c.f. WSI, 2005). It becomes clear that the struggle to balance family and career results in the fact that even in industrialised countries, female employment rates lay significantly below those of men and moreover, that continuous employment and secure full-time careers are difficult to achieve for mothers.

The analysis in the last chapter points out that country-specific institutional arrangements, like policies that encourage a reconciliation of work and family life, play an important role in promoting female labour market participation. In most European countries, it is necessary but not sufficient to further develop child-care facilities and all-day schools to promote the participation of women in the labour market. A comparative case study for France and Germany illustrates that it is essential to create a set of coherent family policy instruments in order to avoid that financial assistance to families, especially the taxation mechanism of family income, discourages mothers’ employment.

In addition, the analysis shows several avenues of further research. Firstly, it is important to integrate more data on the new European member states in the current available data bases, as most of the considered studies are for the EU (15) only. Secondly, it would be useful to extend the time dimension of the data. The limited available time span of the data leads to the fact that most studies focus on cross-section analysis only and do not sufficiently take into consideration the evolution of female employment patterns and of family policies within the last decades. Hence, time-lagged impacts of family policy reforms on female employment can hardly be observed. Further data collection is of prime importance to analyse the impact of recent family policy reforms on the evolution of female employment patterns within the forthcoming years. This is especially revealed by the case study comparing the impact of financial assistance for families on women’s employment patterns in France and Germany, as both countries recently have reformed their parental leave system.

Finally, considering the three chapters as a whole, it becomes clear that another avenue for further research would be an investigation of the link between macro-based evidence and individual behaviour. A macro-micro framework would allow statements about the impact of different types of family support on specific outcomes of a family's labour supply decision-making process. To realise this research, here again further data collection is needed. The OECD is currently developing a data base on family outcomes and family policies with indicators for all OECD countries. The data base brings together information from different OECD databases (for example, the OECD Social Expenditure database, the OECD Benefits and Wages database, or the OECD Education database, and databases of other international organisations) and categorises information under four broad headings, which are family structures, labour market positions of families (i.e. maternal employment by family status; employment profiles over the life-course, time for caring...), public policies for families and children and child outcomes. Nevertheless, in order to extend the analysis to a large time span and non-OECD countries, the OECD data base needs to be completed by other data sources.

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## Tables

### Tables Chapter 1:

**Table 1**

#### Regressions for growth rate of real per capita GDP, part 1

Estimation method	(1)	(2)	(3) INST (difference between coefficients of low & high income groups)	(4)	(5)	(6)
	SUR	INST	INST	INST	INST	INST
log(GDP)	-0.0254 (0.0028)	-0.0261 (0.0031)	0.004 (0.0075)	-0.0262 (0.0032)	-0.0267 (0.0031)	-0.0259 (0.0031)
male secondary education	0.0134 (0.0056)	0.0164 (0.0058)	0.011 (0.0243)	0.0223 (0.0068)	0.0164 (0.0058)	0.0172 (0.0061)
female secondary education	-0.0551 (0.0068)	-0.0090 (0.0070)	-0.0202 (0.0295)	-0.0154 (0.0081)	-0.0102 (0.0071)	-0.0098 (0.0082)
male higher education	0.055 (0.029)	0.050 (0.030)	-0.138 (0.174)	0.044 (0.030)	0.053 (0.030)	0.048 (0.031)
female higher education	-0.085 (0.039)	-0.079 (0.040)	0.167 (0.220)	-0.076 (0.041)	-0.071 (0.036)	-0.078 (0.043)
log (life expectancy)	0.058 (0.013)	0.064 (0.014)	0.111 (0.050)	0.048 (0.016)	0.076 (0.015)	0.061 (0.016)
log(GDP)* human capital	-0.315 (0.097)	-0.290 (0.107)	0.168 (0.316)	-0.307 (0.107)	-0.209 (0.097)	-0.309 (0.130)
G-educ./Y	0.062 (0.085)	0.229 (0.109)	-0.309 (0.219)	0.227 (0.114)	0.205 (0.108)	0.234 (0.107)
I/Y	0.074 (0.020)	0.024 (0.025)	0.030 (0.050)	0.022 (0.028)	0.026 (0.026)	0.024 (0.026)
G-cons./Y	-0.060 (0.023)	-0.113 (0.028)	0.070 (0.080)	-0.134 (0.032)	-0.104 (0.028)	-0.118 (0.030)
log(1+black- market premium)	-0.0309 (0.0047)	-0.0299 (0.0083)	0.0502 (0.0181)	-0.0292 (0.0086)	-0.0312 (0.0078)	-0.0314 (0.077)
political instability	-0.0286 (0.0094)	-0.0329 (0.0183)	0.0392 (0.0313)	-0.0324 (0.0182)	-0.0270 (0.0178)	-0.0341 (0.0182)
growth rate, terms-of-trade	0.130 (0.036)	0.108 (0.038)	0.042 (0.076)	0.091 (0.039)	0.112 (0.037)	0.110 (0.039)
male primary education	—	—	—	-0.0035 (0.0030)	—	—
female primary education	—	—	—	0.0046 (0.0032)	—	—
change in male secondary school	—	—	—	—	0.0066 (0.0065)	—
change in female secondary school	—	—	—	—	-0.0128 (0.0083)	—

*(continued)*

Estimation method	(1)	(2)	(3) INST (difference between coefficients of low & high income groups)	(4)	(5)	(6)
	SUR	INST	INST	INST	INST	INST
change in male higher school	—	—	—	—	0.018 (0.019)	—
change in female higher school	—	—	—	—	-0.028 (0.034)	—
change in log (life expectancy)	—	—	—	—	—	-0.0001 (0.0009)
$R^2$ (number of observations)	0.65 (87) 0.54 (97)	0.62 (87) 0.51 (97)	0.66 (87) 0.54 (97)	0.63 (81) 0.50 (96)	0.64 (87) 0.53 (96)	0.62 (87) 0.50 (94)
serial correlation coefficient	0.21	0.21	0.28	0.22	0.16	0.23
p-values for joint hypothesis	—	—	0.08	0.35	0.22	—

Source: Barro and Sala-i-Martin (1995)

**Table 2**

**Regressions for growth rate of real per capita GDP, part 2**

Estimation method	(7) INST	(8) INST	(9) INST	(10) INST	(11) INST	(12) INST
	(0.0033)	(0.0031)	(0.0031)	(0.0031)	(0.0031)	(0.0033)
male secondary education	0.0147 (0.0065)	0.0149 (0.0061)	0.0160 (0.0059)	0.0152 (0.0061)	0.0166 (0.0060)	0.0170 (0.0057)
female secondary education	-0.0027 (0.0084)	-0.0103 (0.0077)	-0.0093 (0.0072)	-0.0103 (0.0079)	-0.0091 (0.0071)	-0.0098 (0.0070)
male higher education	0.026 (0.038)	0.051 (0.033)	0.055 (0.031)	0.038 (0.034)	0.050 (0.030)	0.068 (0.032)
female higher education	-0.011 (0.063)	-0.086 (0.046)	-0.081 (0.041)	-0.084 (0.048)	-0.079 (0.040)	-0.089 (0.040)
log(life expectancy)	0.059 (0.015)	0.047 (0.013)	0.059 (0.015)	0.045 (0.012)	0.063 (0.015)	0.045 (0.015)
log(GDP)* human capital	-0.438 (0.112)	-0.473 (0.151)	-0.328 (0.117)	-0.526 (0.157)	-0.299 (0.107)	-0.321 (0.121)
$G\text{-}educ./Y$	0.178 (0.108)	0.231 (0.104)	0.231 (0.108)	0.235 (0.102)	0.220 (0.108)	0.119 (0.118)
$I/Y$	0.033 (0.025)	0.016 (0.025)	0.022 (0.025)	0.013 (0.025)	0.025 (0.025)	0.028 (0.023)

(continued)

<b>Estimation method</b>	<b>(7)</b> <b>INST</b>	<b>(8)</b> <b>INST</b>	<b>(9)</b> <b>INST</b>	<b>(10)</b> <b>INST</b>	<b>(11)</b> <b>INST</b>	<b>(12)</b> <b>INST</b>
<i>G-cons./Y</i>	-0.118 (0.030)	-0.128 (0.029)	-0.118 (0.029)	-0.128 (0.028)	-0.114 (0.028)	-0.101 (0.029)
log(1+black-market premium	-0.0333 (0.0082)	-0.0286 (0.0083)	-0.0283 (0.0085)	-0.0302 (0.0083)	-0.0310 (0.0082)	-0.0292 (0.0084)
political instability	-0.0616 (0.0177)	-0.0230 (0.0178)	-0.0322 (0.0174)	-0.0203 (0.0176)	-0.0353 (0.0186)	-0.0368 (0.0170)
growth rate, terms-of-trade	0.106 (0.037)	0.114 (0.037)	0.114 (0.038)	0.103 (0.037)	0.108 (0.038)	0.114 (0.041)
male secondary enrollment	0.013 (0.012)	—	—	—	—	—
female secondary enrollment	-0.030 (0.021)	—	—	—	—	—
male higher enrollment	0.071 (0.063)	—	—	—	—	—
female higher enrollment	-0.118 (0.095)	—	—	—	—	—
log(FERT)	—	-0.0165 (0.0059)	—	-0.0316 (0.0101)	—	—
growth rate of population	—	—	-0.21 (0.19)	-0.63 (0.33)	—	—
change in population share < 15	—	—	—	—	0.007 (0.075)	—
tariff rate	—	—	—	—	—	-0.0176 (0.0081)
<i>R</i> <sup>2</sup> (number of observations)	0.61 (87) 0.51 (94)	0.62 (87) 0.53 (97)	0.62 (87) 0.52 (97)	0.63 (87) 0.54 (97)	0.62 (87) 0.51 (97)	0.63 (74) 0.58 (82)
serial correlation coefficient	0.30	0.17	0.19	0.18	0.21	0.00
p-values for joint hypothesis	0.21	—	—	0.003	—	— ^

Source: Barro and Sala-i-Martin (1995)

**Table 3****Regressions for growth rate of real per capita GDP**

Estimation method	(19) INST	(20) INST	(21) INST (GDP growth rate from World Bank data)	(22) INST (GDP growth and level from World Bank data)	(23) INST uses same sample as [22], with Summers-Heston data	(24) 2SLS (one cross section)
log(GDP)	-0.0235 (0.0033)	-0.0262 (0.0032)	-0.0258 (0.0033)	-0.0141 (0.0023)	-0.0258 (0.0031)	-0.0226 (0.0038)
male secondary education	0.0177 (0.0060)	0.0070 (0.0067)	0.0171 (0.0063)	0.0329 (0.0072)	0.0249 (0.0061)	0.0238 (0.0086)
female secondary education	-0.0093 (0.0071)	0.0026 (0.0084)	-0.0109 (0.0073)	-0.0336 (0.0083)	-0.0165 (0.0075)	-0.0160 (0.0124)
male higher education	0.041 (0.031)	0.056 (0.031)	0.046 (0.030)	0.016 (0.037)	0.038 (0.032)	0.035 (0.046)
female higher education	-0.056 (0.039)	-0.104 (0.043)	-0.078 (0.040)	-0.047 (0.050)	-0.070 (0.042)	-0.047 (0.068)
log (life expectancy)	0.056 (0.016)	0.060 (0.014)	0.082 (0.016)	0.046 (0.014)	0.052 (0.014)	0.051 (0.024)
log(GDP)* human capital	-0.301 (0.110)	-0.407 (0.114)	-0.251 (0.107)	-0.277 (0.092)	-0.416 (0.116)	-0.391 (0.224)
G-educ./Y	0.126 (0.113)	0.178 (0.109)	0.281 (0.118)	0.558 (0.145)	0.332 (0.111)	0.187 (0.196)
I/Y	0.003 (0.029)	0.014 (0.025)	0.037 (0.027)	0.024 (0.035)	0.031 (0.027)	-0.015 (0.044)
G-cons./Y	-0.091 (0.030)	-0.110 (0.027)	-0.070 (0.031)	-0.120 (0.040)	-0.139 (0.031)	-0.096 (0.046)

(continued)

Estimation method	(19) INST	(20) INST	(21) INST (GDP growth rate from World Bank data)	(22) INST (GDP growth and level from World Bank data)	(23) INST uses same sample as [22], with Summers-Heston data	(24) 2SLS (one cross section)
log(1+black- market premium)	-0.0281 (0.0080)	-0.0363 (0.0079)	-0.0249 (0.0100)	-0.0452 (0.0097)	-0.0369 (0.0090)	-0.0360 (0.0196)
political instability	-0.0233 (0.0197)	-0.0227 (0.0178)	-0.0239 (0.0190)	-0.0429 (0.0196)	-0.0339 (0.0163)	-0.0709 (0.0458)
growth rate, terms-of-trade	0.143 (0.038)	0.084 (0.037)	0.068 (0.041)	0.025 (0.047)	0.094 (0.038)	0.135 (0.064)
liquid liabilities ratio	0.0157 (0.0071)	—	—	—	—	—
Sub-Saharan Africa	—	-0.0074 (0.0045)	—	—	—	—
Latin America	—	-0.0139 (0.0040)	—	—	—	—
East Asia	—	0.0014 (0.0048)	—	—	—	—
R <sup>2</sup> (number of observations)	0.57 (72) 0.56 (88)	0.63 (87) 0.57 (97)	0.62 (79) 0.47 (92)	0.62 (57) 0.34 (88)	0.74 (57) 0.51 (88)	0.63 (87) —
serial correlation coefficient	0.06	0.12	0.31	0.39	0.47	—

Source: Barro and Sala-i-Martin (1995)

**Table 4**

Dependent variable	(1) Growth	(2) <i>Inv</i>	(3) <i>Popgro</i>	(4) <i>LFG</i>	(5) Growth	(6) Growth	(7) Growth
Constant	6.33*** (3.4)	3.23 (0.5)	3.74*** (4.5)	4.16*** (4.6)	7.50*** (4.7)	6.82*** (3.8)	7.89*** (5.0)
<i>LNINC60</i>	-1.13*** (-5.0)	-0.10 (-0.1)	-0.13 (-1.1)	-0.18* (-1.4)	-1.21*** (-5.3)	-1.16*** (-5.2)	-1.24*** (-5.4)
<i>Popgro</i> *	-0.55* (-1.4)	-0.81 (-0.8)	—	—	—	-0.47 (-1.1)	—
<i>LFG</i>	0.62* (1.5)	2.60** (2.2)	—	—	—	0.53 (1.2)	—
<i>OPEN</i>	0.007** (1.9)	0.026** (1.9)	—	—	0.009*** (2.6)	0.007** (2.1)	0.010*** (2.7)
<i>Inv</i>	0.056** (1.7)	—	—	—	—	0.055** (1.7)	—
<i>ED60</i>	0.19** (2.3)	0.64** (1.9)	-0.03 (-0.5)	-0.02 (-0.6)	0.23*** (2.5)	0.18** (2.1)	0.21** (2.3)
<i>GED</i>	12.61*** (3.8)	14.10 (0.9)	-0.86 (-0.6)	0.78 (0.5)	14.38*** (3.7)	14.93*** (4.1)	17.47*** (4.2)
<i>RED60</i>	0.90* (1.3)	7.44*** (2.7)	-0.29 (-1.1)	0.19 (0.8)	1.64** (2.3)	0.78 (1.1)	1.46** (2.0)
<i>RGED</i>	0.69*** (3.0)	1.28 (1.2)	-0.22*** (-2.4)	-0.13* (-1.4)	0.75*** (2.8)	0.51** (2.2)	0.55*** (2.2)
Eastern Europe and Central Asia	-0.77 (-0.9)	14.82*** (5.5)	-1.56*** (-7.1)	-2.12*** (-10.4)	-0.57 (-0.8)	-0.74 (-0.9)	-0.48 (-0.7)
Latin America and Caribbean	-1.31** (-1.8)	-4.12** (-2.1)	-0.01 (-0.1)	-0.12 (-0.5)	-1.58** (-2.2)	-1.30** (-1.9)	-1.56** (-2.3)
Middle East and North Africa	-0.15 (-0.2)	-0.44 (-0.2)	0.50** (2.2)	0.25 (1.1)	-0.25 (-0.4)	-0.10 (0.2)	-0.19 (-0.3)
South Asia	-0.46 (-0.7)	-5.35** (-2.4)	-0.20 (-0.9)	-0.25 (-1.1)	-0.78 (-1.1)	-0.42 (-0.6)	-0.72 (-1.1)
Sub-Saharan	-1.42** (-2.1)	-5.53*** (-2.8)	0.27 (1.1)	-0.10 (-0.5)	-1.95*** (-3.0)	-1.38** (-2.0)	-1.85*** (-3.0)
Africa	0.49 (0.7)	7.89*** (3.6)	-1.23*** (-6.1)	-1.64*** (7.5)	0.46 (0.6)	0.59 (0.9)	0.63 (0.9)
OECD	0.61	0.74	0.65	0.71	0.57	0.61	0.59
Adjusted <i>R</i> <sup>2</sup>							
Omitted variables test	Passed	Passed	Passed	Passed	Passed	Passed	Passed
<i>N</i>	109	109	109	109	109	109	109

Source: Klasen (2002)

**Table 5**

Indicator	Upper-bound estimate of growth difference between East Asia and the Pacific and:			Lower-bound estimate of growth difference between East Asia and the Pacific and:		
	Sub-Saharan Africa	South Asia	Middle East and North Africa	Sub-Saharan Africa	South Asia	Middle East and North Africa
Total annual growth difference	3.3	2.5	1.9	3.3	2.5	1.9
Accounted for by						
Direct effect of gender inequality in education (1)	0.45 (0.08, 0.37)	0.69 (0.23, 0.46)	0.63 (0.20, 0.43)	0.34 (0.06, 0.28)	0.54 (0.20, 0.34)	0.49 (0.17, 0.31)
Indirect effect through investment (2)	0.07	0.16	0.14	0.07	0.14	0.13
Indirect effect through population growth (2, 3)	0.09	0.13	0.12	0.07	0.11	0.10
Indirect effect through labor force growth (2, 4)	-0.04	-0.03	-0.03	-0.04	-0.02	-0.02
Total direct and indirect effect (sum of above)	0.56 (0.13, 0.43)	0.95 (0.43, 0.53)	0.86 (0.37, 0.49)	0.44 (0.12, 0.32)	0.77 (0.38, 0.39)	0.69 (0.33, 0.36)
Total effect using reduced form regression (5)	0.54 (0.13, 0.41)	0.92 (0.43, 0.50)	0.83 (0.37, 0.46)	0.42 (0.12, 0.30)	0.75 (0.38, 0.37)	0.67 (0.33, 0.34)

Source: Klasen (2002)

**Table 6**

Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Growth	INV	POPGRO	LFG	Growth	Growth	Growth
Constant	6.33*** (3.4)	3.23 (0.5)	3.74*** (4.5)	4.16*** (4.6)	7.50*** (4.7)	9.73*** (5.1)	7.80*** (4.7)
LNINC60	-1.13*** (-5.0)	-0.10 (-0.1)	-0.13 (-1.1)	-0.18* (-1.4)	-1.21*** (-5.3)	-1.46*** (-5.5)	-1.23*** (-4.8)
POPGRO	-0.55* (-1.4)	-.081 (-0.8)					
LFG	0.62* (1.5)	2.60** (2.2)					
OPEN	0.007** (1.9)	0.026** (1.9)			0.009*** (2.6)	0.006 (1.3)	0.011*** (2.8)
INV	0.056** (1.7)						
ED60	0.19** (2.3)	0.64** (1.9)	-0.03 (-0.5)	-0.02 (-0.6)	0.23*** (2.5)	0.129 (1.1)	0.20** (2.3)
GED	12.61*** (3.8)	14.10 (0.9)	-0.86 (-0.6)	0.78 (0.5)	14.38*** (3.7)	12.20*** (2.6)	12.16*** (3.1)
RED60	0.90* (1.3)	7.44*** (2.7)	-0.29 (-1.1)	0.19 (0.8)	1.64** (2.3)	1.52 (1.2)	1.36** (1.9)
RGED	0.69*** (3.0)	1.28 (1.2)	-0.22*** (-2.4)	-0.13* (-1.4)	0.75*** (2.8)	0.83** (2.0)	0.60*** (2.5)
GEMPF					0.08**		
CHFSLS						0.015 (0.8)	
SSA	-1.42** (-2.1)	-5.53*** (-2.8)	0.27 (1.1)	-0.10 (-0.5)	-1.95*** (-3.0)	-1.93*** (-1.9)	-1.90*** (-3.1)
LAC	-1.31** (-1.8)	-4.12** (-2.1)	-0.01 (-0.1)	-0.12 (-0.5)	-1.58** (-2.2)	-1.12* (-1.2)	-1.38*** (-1.9)
SA	-0.46 (-0.7)	-5.35** (-2.4)	-0.20 (-0.8)	-0.25 (-1.1)	-0.78 (-1.1)	-0.77 (-0.9)	-0.76 (-1.2)
OECD	0.49 (0.7)	7.89*** (3.6)	-1.23*** (-6.1)	-1.64*** (7.5)	0.46 (0.6)	0.78 (0.8)	0.72 (1.0)
MNA	-0.15 (-0.2)	-0.44 (-0.2)	0.50** (2.2)	0.25 (1.1)	-0.25 (-0.4)	0.08 (0.1)	-0.19 (-0.3)
ECA	-0.77 (-0.9)	14.82*** (5.5)	-1.56*** (-7.1)	-2.12*** (-10.4)	-0.57 (-0.8)	-1.06 (-1.2)	-1.04* (-1.3)
Adj. R <sup>2</sup>	0.61	0.74	0.65	0.71	0.57	0.57	0.56
Omitted Var. Test	Passed*	Passed	Passed	Passed	Passed	Passed	Passed
N	109	109	109	109	109	66	102

Source: Klasen (1999)

**Table 7**

Determinants of GDP growth: period averages, 1975–95 <sup>a</sup>				
Variable	Eqn. (1)	Eqn. (2)	Eqn. (3)	Eqn. (4)
Constant	0.011 (4.12)*	0.008 (2.25)**	0.009 (4.19)*	0.016 (8.69)*
$d \log K$	0.556 (16.60)*	0.511 (12.01)*	0.540 (22.11)*	0.567 (13.39)*
$HK$	0.005 (2.44)**	0.005 (1.99)***	0.006 (2.56)**	-0.001 (-0.45)
$WGAP1$		0.015 (1.95)***		
$WGAP2$			0.010 (1.78)***	
$WGAP3$				0.010 (1.77)***
Adjusted $R^2$	0.824	0.881	0.875	0.847
F-statistic	30.84*	47.86*	45.13*	36.25*
$N = 20$				

Source: Seguno (2000)

**Table 8**

	Female share of the labour force (45 to 59 year old women)
% male labour force in white collar sector	-0.793 (2.16)
% female labour force in clerical sector (%FCLER)	-1.25 (2.16)
Years of schooling of adult women (FSCHL)	0.0153 (0.83)
%FCLER * FSCHL	0.168 (2.25)
Constant	0.514 (8.59)
adjusted R <sup>2</sup>	0.18
N	82
(t-statistics in parentheses)	

Source: Goldin (1994)

**Table 9**dependent variable: *FSH* (female share of the labour force)

<i>LGNP</i>	1.3*	1,38*	1,42*	1,38*	1,50*
	(0,32)	(0,32)	(0,33)	(0,32)	(0,31)
<i>LGNP<sup>2</sup></i>	-16,25*	-17,12*	-17,83*	-17,12*	-18,71*
	(4,74)	(6,47)	(4,75)	(4,67)	(4,58)
<i>AFRICA</i>	8,77*	7,83*	7,91**	7,82*	8,21*
	(3,15)	(3,12)	(3,15)	(3,12)	(3,02)
<i>ASIA</i>	4,84	3,88	3,93	3,88	4,18*
	(3,22)	(3,19)	(3,22)	(3,19)	(3,10)
<i>CARAIB</i>	7,96**	7,91**	7,57**	9,91**	7,29**
	(3,41)	(3,35)	(3,38)	(3,35)	(3,27)
<i>LATIN</i>	-1,43	-1,62	-1,52	-1,62	-0,9
	(3,17)	(3,12)	(3,14)	(3,12)	(3,04)
<i>MEAST</i>	-10,04*	-10,09*	-10,04*	-10,09*	-10,55*
	(2,97)	(2,92)	(2,94)	(2,92)	(2,85)
<i>SOUTHA</i>	-9,39*	-9,58*	-9,85*	-9,58**	-9,33*
	(3,80)	(3,73)	(3,76)	(3,73)	(3,64)
<i>XSOC</i>	17,89*	17,47*	18,58*	17,47*	18,55*
	(3,52)	(3,47)	(3,50)	(3,47)	(3,38)
<i>DUM85</i>	0,39	0,57	-0,4	0,57	1,21
	(1,07)	(1,11)	(1,05)	(1,11)	(1,09)
<i>XGP</i>	-3,53	-3,18	-2,59	-3,18	-2,63
	(2,43)	(2,40)	(2,45)	(2,40)	(2,34)
<i>INGP</i>	-0,004	0,006	-0,003	0,006	0,001
	(0,07)	(0,07)	(0,07)	(0,07)	(0,07)
<i>INFLAT</i>	0,003	0,002	0,003	0,002	0,003
	(0,003)	(0,003)	(0,003)	(0,003)	(0,003)
<i>URB</i>	-0,13*	-0,14*	-0,15*	-0,14*	-0,16*
	(0,04)	(0,04)	(0,04)	(0,04)	(0,04)
<i>ALA</i>		2,13***			
		(1,17)			
<i>EIA</i>			2,68**		
			(1,24)		
<i>WBA</i>				3,15*	
				(1,19)	
<i>WBA#</i>					1,42*
					(0,34)
<b>CONSTANT</b>	83,91	85,01	89,21	84,99	89,55
<i>R<sup>2</sup></i>	(16,36)	(16,27)	(16,38)	(16,10)	(15,75)
Adj <i>R<sup>2</sup></i>	0,6	0,61	0,61	0,62	0,64
N	0,57	0,58	0,58	0,59	0,61
	193	193	193	193	193

number in parentheses are standard errors

\* significant at 99% level of confidence

\*\* significant at 95% level of confidence

\*\*\* significant at 90% level of confidence

Source: Cagatay and Özler (1995)

**Tables Chapter 2:**

**Abbreviation indices:**

<i>FLF:</i>	Female share of the labor force (women aged 15 and older)
<i>FAR:</i>	Female activity rate (women aged 15 and older)
<i>RAR:</i>	Ratio female / male activity rates (men and women aged 15 and older)
<i>InGDP:</i>	nat. log of GDP per capita (in constant 2000 US\$)
<i>(InGDP)<sup>2</sup>:</i>	square of nat. log of GDP per capita (in constant 2000 US\$)
<i>EDU:</i>	Percentage of women of the population aged 15 and over who have successfully completed secondary schooling
<i>FERT:</i>	Total fertility rate
<i>OECD:</i>	dummy variable for OECD countries
<i>LA:</i>	dummy variable for Latin America
<i>EA:</i>	dummy variable for East Asia
<i>SSA:</i>	dummy variable for Sub-Saharan Africa
<i>MENA:</i>	dummy variable for Middle East and North Africa
<i>MUSLM:</i>	dummy variable for countries with Muslim population $\geq 50\%$
<i>DV1960s, DV1970s, DV1980s, DV1990s:</i>	time-specific dummy variables for decades

**Table 10: Descriptive statistics, unprepared data**

variable	nb.of observ.	nb.of countries	time period	mean	std. dev.	min	max
<i>FLF</i>	4535	186	1980-2004 1960-	38.70	8.92	5.05	54.04
<i>FAR</i>	1372	171	2005 1960-	42.19	15.68	2.5	93.1
<i>RAR</i>	1372	171	2006 1965-	0.56	0.18	0.29	1.08
<i>InGDP</i>	5817	184	2004 1950-	7.48	1.54	4.03	10.88
<i>EDU</i>	800	120	2000 1960-	7.54	8.15	0.1	50.8
<i>FERT</i>	4485	197	2004	3.63	1.98	0.84	8.5
Data sources:	World Bank's World Development Indicators (2006) ILO Laboursta Data Base (2007) Barro and Lee (2000)						

**Table 11: Descriptive statistics, quinquennial data**

variable	nb.of observ.	nb.of countries	time period	mean	std. dev.	min	max
<i>FLF</i>	925	186	1980-2004	38.66	8.92	6.36	53.91
<i>FAR</i>	727	171	1960-2005	41.10	17.23	2.6	93.1
<i>RAR</i>	727	171	1960-2006	0.53	0.22	0.029	1.08
<i>InGDP</i>	1166	184	1950-2004	7.46	1.54	4.03	10.77
<i>EDU</i>	800	120	1960-2000	7.48	8.05	0.1	50.8
<i>FERT</i>	1395	197	2004	4.15	2.0	0.95	8.50

Source: own calculations

**Table 12: Levin, Lin and Chu test for OECD- countries**

	<i>FLF</i>	<i>FAR</i>	<i>RAR</i>	<i>InGDP</i>
coefficient	-0.279*** (-7.77)	-1.095*** (-37.43)	-0.797*** (-11.46)	-0.335*** (-4.66)
Nb. of countries	30	14	14	27
Nb. of time periods	5	5	5	5
Nb. of observations	108	48	48	96

t statistics in parentheses

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

Source: own estimations

**Table 13: The impact of growth on FLF: model (1)**

	(1) Pooled OLS	(2) FE	(3) RE	(4) IV	(5) System GMM
	<i>FLF</i>	<i>FLF</i>	<i>FLF</i>	<i>FLF</i>	<i>FLF</i>
Constant	101.3*** (14.31)	58.77*** (9.82)	66.40*** (11.34)	100.5*** (13.35)	1.166 (0.55)
<i>L.FLF</i>	.	.	.	.	0.862*** (114.49)
<i>InGDP</i>	-16.14*** (-8.46)	-9.028*** (-5.54)	-8.998*** (-5.70)	-15.91*** (-7.98)	0.752 (1.41)
<i>(InGDP)<sup>2</sup></i>	0.994*** (7.99)	0.811*** (7.28)	0.682*** (6.44)	0.977*** (7.48)	-0.0139 (-0.41)
F	45.48	53.82		38.92	.
Wald Chi <sup>2</sup>	.	.	55.02	.	16101.17
N	786	786	786	732	652
R <sup>2</sup>	0.1041	.	.	0.0965	.
R <sup>2</sup> adjusted	0.1018	.	.	0.0940	.
R <sup>2</sup> within	.	0.1498	0.1206	.	.

t statistics in parentheses

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

Source: own estimations

**Table 14: The impact of growth on FLF: model (2)**

	(1) Pooled OLS	(2) Pooled OLS	(3) FE	(4) IV	(5) System GMM
	<i>FLF</i>	<i>FLF</i>	<i>FLF</i>	<i>FLF</i>	<i>FLF</i>
Constant	87.87*** -12.74	81.85*** -8.85	64.90*** -7.87	84.48*** -8.77	18.87*** -6.3
<i>L.FLF</i>	.	.	.	.	0.804*** -71.91
<i>InGDP</i>	-8.557*** (-4.90)	-9.649*** (-4.25)	-8.843*** (-3.85)	-10.42*** (-4.37)	-3.111*** (-5.01)
<i>(InGDP)<sup>2</sup></i>	0.395*** -3.49	0.566*** -3.87	0.742*** -4.47	0.621*** -4.02	0.223*** -5.96
<i>FERT</i>	-2.054*** (-9.03)	-0.738* (-2.28)	-0.643* (-2.49)	-0.930* (-2.55)	-0.0941 (-1.21)
<i>OECD</i>	2.983*** -3.57	1.569 -1.57	.	0.926 -0.86	.
<i>LA</i>	-4.293*** (-5.67)	-4.056*** (-4.59)	.	-3.013** (-3.15)	.
<i>EA</i>	0.321 -0.19	-0.344 (-0.17)	.	-1.144 (-0.58)	.
<i>SSA</i>	5.747*** -7.68	4.933*** -5.03	.	5.235*** -4.9	.
<i>MENA</i>	-6.495*** (-6.04)	-5.432*** (-3.40)	.	-4.936** (-2.81)	.
<i>DV1980s</i>	-0.703 (-1.09)	-1.798* (-2.34)	-1.280** (-2.83)	-1.53 (-1.85)	0.0845 -0.81
<i>DV1990s</i>	0.0305 -0.05	-0.292 (-0.42)	-0.438 (-1.46)	0.0488 -0.07	-0.0297 (-0.37)
<i>MUSLIM</i>	-7.283*** (-10.03)	-9.036*** (-9.41)	.	-8.318*** (-7.99)	.
<i>EDU</i>	.	0.0376 -0.82	-0.0392 (-1.29)	0.0573 -1.22	0.00223 -0.24
F	82.44	38.64	24.39	29.9	.
Wald Chi <sup>2</sup>	.	.	.	.	16442.8
N	779	450	450	379	366
R <sup>2</sup>	0.5418	0.5148	.	0.495	.
R <sup>2</sup> adjusted	0.5352	0.5015	.	0.4785	.
R <sup>2</sup> within	.	.	0.304	.	.

t statistics in parentheses

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

Source: own estimations

**Table 15: The impact of growth on the female activity rate: model (2)**

	(1) Pooled OLS	(2) Pooled OLS	(3) FE	(4) IV	(5) System GMM
	FAR	FAR	FAR	FAR	FAR
Constant	162.2*** -8.83	189.5*** -8.32	146.7** -2.88	191.0*** -8.19	181.6*** -10.62
<i>L.FAR</i>	.	.	.	.	0.586*** -19.05
<i>InGDP</i>	-25.70*** (-5.63)	-33.43*** (-5.99)	-18.37 (-1.53)	-34.21*** (-6.12)	-37.16*** (-9.50)
<i>(InGDP)<sup>2</sup></i>	1.508*** -5.22	2.041*** -5.77	0.855 -1.16	2.077*** -6	2.187*** -9.24
<i>FERT</i>	-1.895** (-3.06)	-1.953* (-2.53)	-2.164* (-2.00)	-1.318 (-1.69)	-2.541*** (-5.91)
<i>OECD</i>	-0.765 (-0.42)	0.133 -0.06	.	-1.1 (-0.55)	.
<i>LA</i>	-7.504*** (-4.21)	-5.064* (-2.46)	.	-3.877 (-1.90)	.
<i>EA</i>	14.1 -1.67	14.33 -1.7	.	11 -1.38	.
<i>SSA</i>	6.845** -3.19	9.560*** -3.92	.	5.345* -2.15	.
<i>MENA</i>	-9.823** (-3.28)	-5.244 (-1.01)	.	-4.805 (-1.01)	.
<i>DV1960s</i>	-10.44* (-2.32)	-7.876 (-1.43)	-15.50** (-2.94)	.	0.795 -0.36
<i>DV1970s</i>	-11.81*** (-5.39)	-12.00*** (-4.81)	-15.24*** (-5.09)	-10.73*** (-4.76)	-0.796 (-0.59)
<i>D1980s</i>	-5.550** (-3.12)	-5.184* (-2.50)	-8.092*** (-3.96)	-4.135* (-2.18)	0.94 -0.94
<i>DV1990s</i>	-1.762 (-1.09)	-1.494 (-0.78)	-3.350* (-2.31)	-2.115 (-1.33)	0.16 -0.18
<i>MUSLIM</i>	-16.77*** (-8.07)	-19.87*** (-8.25)	.	-21.04*** (-7.94)	.
<i>EDU</i>	.	-0.139 (-1.24)	0.0566 -0.42	-0.00288 (-0.03)	-0.0373 (-0.55)
F Wald Chi <sup>2</sup>	33.45	20.33	21.45	20.74	813.83
N	466	329	329	303	221
R <sup>2</sup>	0.4903	0.4755	.	0.4826	.
R <sup>2</sup> adjusted	0.4756	0.4521	.	0.4593	.
R <sup>2</sup> within	.	.	0.4273	.	.

t statistics in parentheses

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

Source: own estimations

**Table 16: The impact of growth on the female activity rate:  
model (2), without 1960s and 1970s**

	(1) Pooled OLS	(2) Pooled OLS	(3) FE	(4) IV	(5) System GMM
	FAR	FAR	FAR	FAR	FAR
Constant	175.8*** -8.79	212.5*** -8.46	93.89 -1.34	204.9*** -7.83	165.3*** -6.35
L.FAR	.	.	.	.	0.449*** -7.12
InGDP	-28.98*** (-5.87)	-39.40*** (-6.48)	-6.24 (-0.36)	-37.81*** (-6.09)	-33.24*** (-5.58)
(InGDP) <sup>2</sup>	1.701*** -5.45	2.418*** -6.32	0.214 -0.2	2.306*** -6.03	1.981*** -5.47
FERT	-1.990** (-2.84)	-2.071* (-2.33)	-2.35 (-1.63)	-1.256 (-1.39)	-1.468* (-2.19)
OECD	-1.029 (-0.52)	-0.695 (-0.31)	.	-1.513 (-0.71)	.
LA	-6.620*** (-3.44)	-3.723 (-1.69)	.	-3.123 (-1.43)	.
EA	12.88 -1.52	13.02 -1.56	.	9.986 -1.26	.
SSA	6.144** -2.64	9.540*** -3.62	.	6.125* -2.27	.
MENA	-10.47** (-3.26)	-4.524 (-0.88)	.	-4.538 (-0.84)	.
D1980s	-5.418** (-2.99)	-5.037* (-2.42)	-8.059** (-3.19)	-4.192* (-2.20)	-0.335 (-0.28)
DV1990s	-1.736 (-1.07)	-1.422 (-0.76)	-3.479* (-2.20)	-2.288 (-1.46)	-0.303 (-0.36)
MUSLIM	-16.30*** (-7.36)	-19.72*** (-7.68)	.	-22.46*** (-8.06)	.
EDU	.	-0.149 (-1.27)	-0.105 (-0.58)	-0.0322 (-0.29)	0.113 -1.06
F	29.86	19.34	9.17	16.98	.
Wald Chi <sup>2</sup>	.	.	.	.	210.53
N	383	266	266	247	165
R <sup>2</sup>	0.4696	0.4784	.	0.4655	.
R <sup>2</sup> adjusted	0.4539	0.4537	.	0.4381	.
R <sup>2</sup> within	.	.	0.2446	.	.

t statistics in parentheses

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

Source: own estimations

**Table 17: The impact of growth on the ratio female/male activity rate: model (2)**

	(1) Pooled OLS	(2) Pooled OLS	(3) FE	(4) IV	(5) System GMM
	RAR	RAR	RAR	RAR	RAR
Constant	1.820*** -8.27	2.083*** -7.7	2.033*** -3.4	2.137*** -7.46	1.722*** -7.6
<i>L.RAR</i>	.	.	.	.	0.668*** -20.66
<i>InGDP</i>	-0.254*** (-4.64)	-0.337*** (-5.09)	-0.290* (-2.05)	-0.359*** (-5.23)	-0.342*** (-6.56)
<i>(InGDP)<sup>2</sup></i>	0.0150*** -4.34	0.0212*** -5.05	0.0156 -1.8	0.0226*** -5.32	0.0203*** -6.44
<i>FERT</i>	-0.0318*** (-4.29)	-0.0286** (-3.12)	-0.0242 (-1.90)	-0.0230* (-2.40)	-0.0331*** (-5.86)
<i>OECD</i>	0.00334 -0.15	0.0129 -0.51	.	-0.00859 (-0.35)	.
<i>LA</i>	-0.120*** (-5.61)	-0.0970*** (-3.97)	.	-0.0821** (-3.28)	.
<i>EA</i>	0.111 -1.09	0.133 -1.33	.	0.102 -1.05	.
<i>SSA</i>	0.106*** -4.11	0.142*** -4.89	.	0.104*** -3.39	.
<i>MENA</i>	-0.108** (-3.00)	-0.0507 (-0.82)	.	-0.0441 (-0.76)	.
<i>DV1960s</i>	-0.213*** (-3.95)	-0.205** (-3.13)	-0.254*** (-4.11)	.	-0.014 (-0.49)
<i>DV1970s</i>	-0.195*** (-7.41)	-0.202*** (-6.84)	-0.236*** (-6.70)	-0.179*** (-6.48)	-0.00886 (-0.49)
<i>DV1980s</i>	-0.104*** (-4.90)	-0.105*** (-4.29)	-0.128*** (-5.33)	-0.0850*** (-3.65)	0.0141 -1.07
<i>DV1990s</i>	-0.0404* (-2.09)	-0.0427 (-1.88)	-0.0555** (-3.26)	-0.0416* (-2.12)	-0.00155 (-0.14)
<i>MUSLIM</i>	-0.230*** (-9.22)	-0.270*** (-9.44)	.	-0.279*** (-8.58)	.
<i>EDU</i>	.	-0.0019 (-1.42)	0.0002 -0.13	-0.00089 (-0.68)	-0.00048 (-0.55)
F Wald Chi <sup>2</sup>	46.26	29.28	35.48	28.55	1052.55
N	466	329	329	303	221
R <sup>2</sup>	0.5709	0.5662	.	0.5622	.
R <sup>2</sup> adjusted	0.5586	0.5469	.	0.5425	.
R <sup>2</sup> within	.	.	0.5524	.	.

t statistics in parentheses

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

Source: own estimations

**Table 18: The impact of *InGDP* on *FLF*, *FAR* and *RAR* for subgroups of countries**

	FE estimation					
	OECD			SSA		
	<i>FLF</i>	<i>FAR</i>	<i>RAR</i>	<i>FLF</i>	<i>FAR</i>	<i>RAR</i>
Constant	321.4*** (3.81)	808.3*** (3.64)	7.711** (2.78)	34.73*** (5.84)	-190.8 (-0.35)	-1.367 (-0.19)
<i>InGDP</i>	-64.59*** (-3.76)	-159.0*** (-3.50)	-1.535** (-2.71)	1.145 (0.56)	95.62 (0.62)	0.937 (0.47)
<i>(InGDP)<sup>2</sup></i>	3.722*** (4.20)	8.316*** (3.51)	0.0838** (2.84)	-0.104 (-0.58)	-8.248 (-0.76)	-0.0840 (-0.60)
<i>FERT</i>	-1.768** (-2.81)	-1.474 (-0.84)	-0.0137 (-0.62)	0.923*** (4.96)	-4.532 (-0.74)	-0.0766 (-0.96)
<i>EDU</i>	-0.0592* (-2.39)	0.0719 (0.63)	0.000198 (0.14)	-0.0368 (-0.80)	1.838 (1.58)	0.0207 (1.38)
<i>DV1960s</i>	;	-13.73* (-2.45)	-0.207** (-2.95)	.	.	.
<i>DV1970s</i>	.	-14.21*** (-3.83)	-0.211*** (-4.55)	.	-9.265 (-0.65)	-0.184 (-0.99)
<i>DV1980s</i>	-0.924 (-1.22)	-6.378* (-2.58)	-0.0973** (-3.15)	-0.125 (-0.43)	-2.565 (-0.21)	-0.0829 (-0.52)
<i>DV1990s</i>	0.00668 (0.01)	-1.823 (-1.01)	-0.0267 (-1.18)	0.0119 (0.06)	-7.456 (-1.02)	-0.130 (-1.37)
F	28.45	16.64	28.17	10.95	0.91	1.56
N	116	118	118	122	45	45
R <sup>2</sup> within	0.6728	0.6131	0.7285	0.4275	0.2971	0.4209

t statistics in parentheses

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

Source: own estimations

	(1) Pooled OLS FAR_MA	(2) FE FAR_MA
Constant	154.2*** -10.43	176.6*** -8.49
<i>InGDP_MA</i>	-24.00*** (-6.65)	-29.99*** (-5.90)
<i>(InGDP)<sup>2</sup>_MA</i>	1.393*** -6.01	1.736*** -5.33
<i>FERT_MA</i>	-0.856 (-1.68)	-2.150*** (-4.39)
<i>OECD</i>	-0.496 (-0.34)	.
<i>LA</i>	-9.935*** (-7.12)	.
<i>EA</i>	15.71*** -3.42	.
<i>SSA</i>	4.242** -2.82	.
<i>MENA</i>	-7.331** (-2.79)	.
<i>DV1960s</i>	-13.36*** (-8.19)	-8.551*** (-7.56)
<i>DV1970s</i>	-9.455*** (-6.50)	-6.685*** (-7.45)
<i>DV1980s</i>	-5.963*** (-4.43)	-4.640*** (-6.83)
<i>DV1990s</i>	-1.886 (-1.40)	-2.119*** (-3.46)
<i>Muslim</i>	-23.06*** (-14.92)	.
<i>EDU_MA</i>	0.103 -1.14	0.309*** -4.13
F	65.77	84.12
N	890	890
R <sup>2</sup>	0.5128	.
R <sup>2</sup> adjusted	0.505	.
R <sup>2</sup> within	.	0.4641

t statistics in parentheses

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

Source: own estimations

**Table 20: Granger Causality Test from *FLF/FAR/RAR* to *InGDP* with bigger lags**

	(1) Pooled OLS <i>FLF</i>	(2) Pooled OLS <i>FAR</i>	(3) Pooled OLS <i>RAR</i>
Constant	6.294 (0.93)	23.30 (0.88)	0.291 (0.96)
<i>L3.FLF</i>	1.720*** (10.52)	.	.
<i>L4.FLF</i>	-0.899*** (-5.67)	.	.
<i>L3.FAR</i>	.	0.733*** (6.47)	.
<i>L4.FAR</i>	.	-0.0269 (-0.23)	.
<i>L3.RAR</i>	.	.	0.835*** (7.30)
<i>L4.RAR</i>	.	.	-0.0910 (-0.78)
<i>L3.InGDP</i>	-19.50** (-2.88)	-51.19 (-1.51)	-0.799* (-2.03)
<i>L4.InGDP</i>	19.47** (2.95)	49.02 (1.51)	0.766* (2.03)
<i>L3.(InGDP)<sup>2</sup></i>	1.329** (2.96)	2.120 (1.04)	0.0390 (1.65)
<i>L4.(InGDP)<sup>2</sup></i>	-1.299** (-2.98)	-1.907 (-0.97)	-0.0356 (-1.56)
F	185.48	47.78	70.83
N	134	133	133
R <sup>2</sup>	0.8976	0.6947	0.7713
R <sup>2</sup> adjusted	0.8927	0.6801	0.7604

t statistics in parentheses

\* p<0.05, \*\* p<0.01, \*\*\*

p<0.001

Source: own estimations

**Table 21: Granger Causality Test from  $\ln GDP$  to  
FLF/FAR/RAR with bigger lags**

	(1) Pooled OLS $\ln GDP$	(2) Pooled OLS $\ln GDP$	(3) Pooled OLS $\ln GDP$
Constant	0.985 (1.09)	-0.407 (-0.43)	-0.466 (-0.50)
L3.FLF	0.0138 (0.63)	.	.
L4.FLF	-0.0243 (-1.15)	.	.
L3.FAR	.	0.00116 (0.35)	.
L4.FAR	.	0.00186 (0.57)	.
L3.RAR	.	.	0.0842 (0.29)
L4.RAR	.	.	0.200 (0.68)
L3. $\ln GDP$	0.605 (0.67)	1.401 (1.34)	1.485 (1.42)
L4. $\ln GDP$	0.232 (0.26)	-0.295 (-0.29)	-0.365 (-0.36)
L3.( $\ln GDP$ ) <sup>2</sup>	0.0630 (1.06)	0.00973 (0.15)	0.00408 (0.06)
L4.( $\ln GDP$ ) <sup>2</sup>	-0.0499 (-0.86)	-0.0154 (-0.25)	-0.0109 (-0.17)
F	490.44	508.19	511.69
N	134	139	139
R <sup>2</sup>	0.9586	0.9585	0.9588
R <sup>2</sup> adjusted	0.9567	0.9566	0.9569

t statistics in parentheses

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

Source: own estimations

**Tables Chapter 3:**

**Table 22: Employment rates of women and men (aged 25-49), depending on whether they have children (under 12) - 2006**

	women		men		difference	
	without children	with children	without children	with children	women	men
<b>Germany</b>	80,3	62,7	80,6	91,4	-17,6	10,8
<b>Austria</b>	83,6	68,5	87,7	92,9	-15,1	5,2
<b>Belgium</b>	75,5	69,3	81,7	92,2	-6,2	10,5
<b>Spain</b>	75,5	58,8	84,3	93,2	-16,7	8,9
<b>Finland</b>	78,9	70,6	79,5	92,7	-8,3	13,2
<b>France</b>	73,7	65,9	76,6	91,1	-7,8	14,5
<b>Greece</b>	64,1	57,0	82,5	96,8	-7,1	14,3
<b>Italy</b>	66,7	54,6	80,7	93,8	-12,1	13,1
<b>Luxembourg</b>	80,2	65,0	90,3	95,7	-15,2	5,4
<b>Netherlands</b>	83,8	72,7	87,9	94,5	-11,1	6,6
<b>Portugal</b>	77,3	76,4	82,7	94,2	-0,9	11,5
<b>UK</b>	82,9	63,1	84,1	91,9	-19,8	7,8
<b>Cyprus</b>	82,1	70,8	87,8	95,7	-11,3	7,9
<b>Estonia</b>	82,7	66,7	86,9	92,4	-16,0	5,5
<b>Hungary</b>	76,1	49,8	79,1	86,1	-26,3	7,0
<b>Latvia</b>	82,1	68,4	80,9	91,2	-13,7	10,3
<b>Lithuania</b>	81,5	77,2	78,9	89,7	-4,3	10,8
<b>Malta</b>	68,7	32,6	88,6	94,0	-36,1	5,4
<b>Poland</b>	69,9	60,8	71,5	88,0	-9,1	16,5
<b>Czech Rep.</b>	83,2	53,4	87,1	93,9	-29,8	6,8
<b>Slovakia</b>	79,0	54,2	79,5	88,2	-24,8	8,7
<b>Slovenia</b>	77,1	84,8	82,7	95,3	7,7	12,6
<b>Bulgaria</b>	74,7	61,5	76,6	81,2	-13,2	4,6
<b>Romania</b>	70,7	66,3	76,9	85,4	-4,4	8,5
<b>EU-24</b>	77,1	63,8	82,3	91,7	-13,3	9,4
<b>EU-27</b>	76,0	62,4	80,8	91,4	-13,6	10,6

Source: European Labour Force Survey (2006)

**Table 23: Part-time employment rates for women and men aged 20 to 49 with regard to the presence of children, 2003**

	women		men		difference	
	without children	with children	without children	with children	women	men
<b>Germany</b>	21,3	35,1	4,3	3,0	13,8	-1,3
<b>Austria</b>	16,8	32,3	2,3	1,5	15,5	-0,8
<b>Belgium</b>	21,8	27,2	4,2	4,3	5,4	0,1
<b>Spain</b>	8,7	9,7	1,4	0,9	1,0	-0,5
<b>Finland</b>	10,2	7,8	5,0	2,4	-2,4	-2,6
<b>France</b>	14,1	17,6	3,3	2,5	3,5	-0,8
<b>Greece</b>	4,9	6,7	2,1	2,4	1,8	0,3
<b>Italy</b>	12,3	15,2	3,3	3,3	2,9	0,0
<b>Luxembourg</b>	15,5	26,1	—	1,6	10,6	—
<b>Netherlands</b>	33,0	54,7	7,8	4,2	21,7	-3,6
<b>Portugal</b>	7,7	7,2	2,0	1,0	-0,5	-1,0
<b>UK</b>	18,5	36,2	3,4	3,3	17,7	-0,1
<b>Cyprus</b>	8,8	8,3	-2,2	1,5	-0,5	3,7
<b>Estonia</b>	4,5	4,9	4,0	1,8	0,4	-2,2
<b>Hungary</b>	2,3	3,7	1,2	0,9	1,4	-0,3
<b>Latvia</b>	5,1	7,6	3,1	3,5	2,5	0,4
<b>Lithuania</b>	9,9	12,7	4,2	4,7	2,8	0,5
<b>Malta</b>	8,6	8,4	—	—	-0,2	—
<b>Poland</b>	8,6	10,1	3,0	2,3	1,5	-0,7
<b>Czech Rep.</b>	2,4	3,9	0,6	0,5	1,5	-0,1
<b>Slovakia</b>	2,0	1,6	-0,8	—	-0,4	—
<b>Slovenia</b>	2,6	1,8	1,7	0,8	-0,8	-0,9
<b>EU-22</b>	10,9	15,4	2,7	2,3	4,5	-0,5

Source: Eurostat Labour Force Survey (2003)

**Table 24 in chapter 3, page 139**

**Table 25: Gender pay gap, educational attainment, gender segregation, distribution of managers, 1995, 2006, 2007**

	Gender Pay Gap <sup>1</sup>			Educational attainment <sup>2</sup> (2006)			Gender segregation <sup>3</sup> (2006)		Distribution of Managers <sup>4</sup> (2006)		
	1995	2007	Variation	Women	Men	Diff. Women - Men	in occupations	in sectors	Women	Men	Diff. Women - Men
Austria	22	20	-2,0	86,7	84,9	-1,8	25,9	19,3	28,7	71,3	-42,6
Belgium	12	7(p)	-5,0	85,6	79,1	-6,5	26,1	18,3	31,3	68,7	-37,4
Bulgaria	:	14	:	81,1	80,0	-1,1	28,7	19,6	30,5	69,5	-39,0
Cyprus	29	24(p)	-5,0	90,7	76,1	-14,6	29,3	19,6	16,1	83,9	-67,8
Czech Rep.	:	18	:	92,4	91,1	-1,3	18,9	19,1	29,2	70,8	-41,6
Denmark	15	17	2,0	81,5	73,4	-8,1	27,8	19,4	24,3	75,7	-51,4
Estonia	27	:	:	89,8	74,1	-15,7	31,6	24,3	33,4	66,6	-33,2
Finland	:	20	:	87,0	82,3	-4,7	29,0	22,7	29,5	70,5	-41,0
France	13	11(p)	-2,0	84,3	80,0	-4,3	26,6	18,1	38,5	61,5	-23,0
Germany	21	22	1,0	73,5	69,8	-3,7	26,5	18,2	27,4	72,6	-45,2
Greece	17	10	-7,0	86,6	75,5	-11,1	22,4	15,9	26,8	73,2	-46,4
Hungary	22	11	-11,0	84,7	81,2	-3,5	28,8	19,9	37,1	62,9	-25,8
Ireland	20	9	-11,0	89,1	81,8	-7,3	26,8	22,7	30,2	69,8	-39,6
Italy	8	:	:	79,4	71,7	-7,7	23,7	17,8	32,9	67,1	-34,2
Latvia	:	16	:	86,2	75,9	-10,3	29,4	23,8	40,6	59,4	-18,8
Lithuania	27	16	-11,0	91,2	85,3	-5,9	29,4	23,1	40,7	59,3	-18,6
Luxembourg	19	14	-5,0	74,5	64,0	-10,5	26,4	18,3	25,9	74,1	-48,2
Malta	:	3	:	52,8	48,1	-4,7	24,7	16,5	18,6	81,4	-62,8
Netherlands	23	:	:	79,6	69,9	-9,7	25,6	18,0	27,0	73,0	-46,0
Poland	:	12	:	93,8	89,6	-4,2	25,5	19,4	35,2	64,8	-29,6
Portugal	5	8(p)	3,0	58,6	40,8	-17,8	26,5	20,4	33,1	66,9	-33,8
Romania	21	10	-11,0	77,8	76,6	-1,2	22,8	15,5	31,1	68,9	-37,8
Slovakia	:	22	:	91,7	91,2	-0,5	29,9	22,8	27,7	72,3	-44,6
Slovenia	14	8(p)	-6,0	91,4	87,7	-3,7	26,8	17,8	33,4	66,6	-33,2
Spain	13	13	0,0	69,0	54,6	-14,4	27,1	20,4	31,8	68,2	-36,4
Sweden	15	16	1,0	88,6	84,5	-4,1	26,8	21,6	31,8	68,2	-36,4
UK	26	21	-5,0	80,3	77,3	-3	25,6	18,6	34,8	65,2	-30,4
EU (27)	17(s)	15(s)	-2,0	80,7	74,8	-5,9	26,6	19,7	32,6	67,4	-34,8
EU (25)	17(s)	15(s)	-2,0	82,2	75,1	-7,1	26,6	19,7	30,8	69,2	-38,4
EU (15)	17(s)	:	:	79,9	73,0	-6,9	26,6	19,7	31,7	68,3	-36,7

12 NMS	23,3	14,2	-9,2	81,1	74,6	-6,5	26,4	19,5	31,7	68,3	-36,5
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:=Not available s=Eurostat estimate p=Provisional value

Sources: Eurostat, Labour Force Survey (LFS)

<sup>1</sup> Gender pay gap (in unadjusted form) is given as the difference between average gross hourly earnings of male paid employees and of female paid employees as a percentage of average gross hourly earnings of male paid employees. The population consists of all paid employees aged 16-64 that are 'at work 15+ hours per week'.\* Germany includes ex-GDR from 1991.

<sup>2</sup> Educational attainment (at least upper secondary school) of women and men aged 20-24. Students living abroad for one year or more and conscripts on compulsory military service are not covered by the EU Labour Force Survey, which may imply lower rates than those available at national level. This is especially relevant for the CY.

<sup>3</sup> Gender segregation in occupations is calculated as the average national share of employment for women and men applied to each occupation; differences are added up to produce the total amount of gender imbalance expressed as a proportion of total employment (ISCO classification). Gender segregation in sectors is calculated as the average national share of employment for women and men applied to each sector; differences are added up to produce the total amount of gender imbalance expressed as a proportion of total employment (NACE classification).

<sup>4</sup> Managers are persons classified in ISCO 12 and 13.

**Table 26: Classic instruments of financial assistance to families  
in Germany and France, 2007**

	<b>Germany</b>	<b>France</b>
<b>lump-sum benefits</b>	<p><b><i>lump-sum child benefit</i></b> <i>(Kindergeld)</i></p> <p>1 child: 154€ / month 2 children: 308€ / month 3 children: 462€ / month 4 children: 641€ / month 5 children: 820€ / month 6 children: 999€ / month supplement per child: 179€ / month or:</p> <p><b><i>tax allowance for children</i></b> <i>(Kinderfreibetrag)</i></p> <p>3648€ / year / child for married couples 1824€ / year /child for sole parents</p> <p><b><i>tax allowance for children related expenses</i></b> <i>(Betreuungsfreibetrag)</i></p> <p>2160€ / year / child for married couples 1080€ / year /child for sole parents</p>	<p><b><i>lump-sum child benefit</i></b> <i>(allocation familiale)</i></p> <p>1 child: - 2 children: 119,14€ / month 3 children: 271,75€ / month 4 children: 424,38€ / month 5 children: 577,01€ / month 6 children: 729,64€ / month supplement per child: 152,63€ / month and:</p> <p><b><i>cash supplement</i></b></p> <p>child older than 11 years : 33,51€ / month child older than 16 years : 59,57€ / month only two children: no supplement for the older one</p>
<b>premium for low-income households</b>  conditional on an income ceiling	<p><b><i>child premium</i></b> <i>(Kinderzuschlag)</i></p> <p>for children under 25 years max. 140€ / child / month for max. 36 months</p>	<p><b><i>child premium</i></b> <i>(complément familial)</i></p> <p>for families with at least 3 children all aged between 3 and 21 years 155,05€ month / 1860,60€ year</p>

Data Germany: January 2007; data France: Mai 2007,  
Sources: BMFSFJ (Bundesministerium für Familie, Senioren, Frauen und Jugend) 2007, CNAF (Caisse nationale d'allocations familiales) 2007, MISSOC (Mutual Information System on Social Protection) 2006.

**Table 27: Parental leave benefit in Germany and France, 2007**

Germany	France
<b>Parental leave benefit (Elterngeld)</b>	<b>Parental leave benefit (Prestation d'accueil du jeune enfant: PAJE)</b>
without income ceiling	conditional on an income ceiling
	<p>1. premium allocated at birth or adoption 855,25 € in the 7th month of pregnancy 1710,49 € in case of an adoption of a child under 20 years</p> <p>2. baseline benefit 171,06€ / month / family</p>
<u>complete work cessation:</u> 67% net wage substitution max. 1800€ / month min. 300€ / month  <u>part-time work:</u> max. 30 hours / week: 67% of the difference between the previous full-time earnings and the current part-time salary	<p>3. supplement for free activity choice (complément du libre choix d'activité)</p> <p><u>complete work cessation:</u>            530,72€ / month            without baseline benefit            359,67€ / months            with baseline benefit</p> <p><u>part-time work, max. 50%:</u>            403,52€ / month            without baseline benefit            232,52€ / month            with baseline benefit</p> <p><u>part-time work, 50 - 80%:</u>            305,17€ / month            without baseline benefit            134,13€ / month            with baseline benefit</p>

Data Germany: January 2007; data France: Mai 2007,

Sources: BMFSFJ (Bundesministerium für Familie, Senioren, Frauen und Jugend) 2007, CNAF (Caisse nationale d'allocations familiales) 2007, MISSOC (Mutual Information System on Social Protection) 2006.

**Table 28: Financial assistance reducing the cost of child care  
in Germany and France, 2007**

Germany	France
<b>tax deductibility of child care costs</b> (Absetzbarkeit Kinderbetreuungskosten)	<b>supplement for free choice of childcare</b> (complément du libre choix du mode de garde : 4th element of PAJE)
limited deduction without income ceiling  <i>tax reduction for lone working parents and working couples</i>  reduction of tax duties by two thirds of child care costs max. 4000€ per year and per child (0-14 years)	conditional on an income ceiling  <i>childminder or nanny cost coverage</i>  max. 374,75€ per month and per child (0-6 years) depending on household's income and age of child + coverage of social security contributions
<b>or:</b>  <i>tax allowance for lone non-working parents or couples where only one partner is employed</i>  tax allowance by two-thirds of child care costs max. 4000€ per year and per child (3-6 years)	<b>or:</b>  <i>cost coverage of an association or a company which employs child minders or nannies</i>  max. 776,25€ per months and per child (0-6 years) depening on hh's income and age and number of children

Data Germany: January 2007; data France: Mai 2007,

Source: BMFSFJ (Bundesministerium für Familie, Senioren, Frauen und Jugend) 2007, CNAF (Caisse nationale d'allocations familiales) 2007, MISSOC (Mutual Information System on Social Protection) 2006.

**Table 29 in chapter 3, page 170  
Table 30 in chapter 3, page 175**

## Résumé

This thesis shows that women's labour market participation, macroeconomic growth and family policies are closely linked to each other. Whereas there exists clear theoretical and empirical evidence that female labour market participation unambiguously promotes GDP growth, the inverse impact of GDP growth on female labour market participation is not as clear in the existing literature. While some economists assume a strictly positive impact of growth on female labour market participation, recent studies suggest that growth decreases female labour market participation at early stages of economic development and increases it at later stages only. The convex impact, also known as "feminisation U" hypothesis, has not yet been proven empirically, as existing time series and cross country studies do not offer precise results so far. I test the "feminisation U" hypothesis based on panel data that spans over 180 countries and over 40 years, which allows to adequately take into account endogeneity problems. The analysis confirms the "feminisation U" hypothesis and makes clear that simply relying on macroeconomic growth is not sufficient to promote female labour market participation. Equalising institutions that explicitly promote women's, and especially mothers' labour market participation are necessary not only in developing but also in industrialised countries. Yet, the analysis shows further that in most European countries, the redistributive character of several family policy instruments risks discouraging mothers' labour supply. Hence, it is essential to create a set of coherent family policy instruments that manage to simultaneously prevent families from income poverty while encouraging women's employment and fertility at the same time.

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Die vorliegende Dissertation zeigt, dass die Arbeitsmarktbeteiligung von Frauen, makroökonomisches Wachstum und familienpolitische Instrumente in enger Verbindung miteinander stehen. Während sowohl theoretisch als auch empirisch eindeutig bewiesen ist dass die Arbeitsmarktbeteiligung von Frauen eindeutig das Wachstum des Bruttoinlandprodukts fördert, gibt es bis heute keine klare Antwort auf die Frage nach der umgekehrten Wirkung von ökonomischem Wachstum auf die Arbeitsmarktbeteiligung von Frauen. Einige Ökonomen gehen von einem rein positiven Einfluss aus, allerdings legen jüngste empirische Arbeiten eher nahe, dass ökonomisches Wachstum die Arbeitsmarktbeteiligung von Frauen erst senkt und erst ab einem höheren Einkommensniveau erhöht. Dieser konvexe Einfluss, auch bekannt als die „feminisation U“ - Hypothese, konnte von bisherigen Zeitreihen- und Querschnittsstudien noch nicht eindeutig empirisch bewiesen werden. Ich teste diese Hypothese empirisch mit Makro - Paneldaten, die sich über 180 Länder und 40 Jahre erstrecken. Diese Datenstruktur ermöglicht es, auf Endogenitätsprobleme adäquat einzugehen. Meine Analyse bestätigt die „feminisation U“ – Hypothese und zeigt auf, dass ein Vertrauen auf die Kräfte makroökonomischen Wachstums nicht ausreichend ist, um die Arbeitsmarktbeteiligung von Frauen zu erhöhen. Gleichstellungsfördernde Institutionen, die die Arbeitsmarktbeteiligung von Frauen, und insbesondere von Müttern, explizit fördern, sind nicht nur in Entwicklungs- sondern auch in Industrieländern von Nöten. Allerdings zeigt die vorliegende Analyse, dass in vielen europäischen Ländern der redistributive Charakter vieler familienpolitischer Instrumente das Arbeitsangebot von Müttern negativ beeinträchtigt. Es scheint daher angebracht, den Mix der familienpolitischen Instrumente kohärenter zu gestalten, damit gleichzeitig Familienarmut bekämpft und die Arbeitsmarktbeteiligung von Frauen sowie auch die Geburtenraten in Europa erhöht werden können.

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Cette thèse recherche le lien entre l'emploi des femmes et la croissance macroéconomique en prenant en compte les effets des politiques familiales. Tandis que plusieurs modèles théoriques et analyses empiriques montrent un impact strictement positif de l'emploi des femmes sur la croissance macroéconomique, l'impact inverse de la croissance sur l'emploi des femmes n'est pas si clair. Quelques économistes suggèrent un impact strictement positif, mais des études empiriques récentes estiment que la croissance du PIB baisse d'abord l'emploi des femmes et l'augmente seulement à mi et long terme à partir d'un certain niveau de développement économique. Cet impact convexe (« feminisation U » hypothesis) n'est pas encore prouvé par des études empiriques, car les études existantes se basent seulement sur des données de séries temporelles ou de séries transversales et n'apportent pas des résultats explicites. Je propose donc une propre analyse empirique de l'impact de la croissance macroéconomique sur l'emploi des femmes, basée sur des données de panel, qui contiennent des observations de plus de 180 pays et de plus de 40 ans. La structure de la base de données me permet de prendre en compte des problèmes d'endogénéité. Mon analyse confirme un impact convexe de la croissance macroéconomique sur l'emploi des femmes. Ce résultat montre que pour promouvoir l'emploi des femmes, on ne peut pas toujours compter sur la croissance. Des institutions promouvant l'égalité hommes-femmes sont nécessaires pour encourager l'emploi des femmes, et surtout l'emploi des mères, non seulement dans les pays en développement mais aussi dans les pays industrialisés. Toutefois, dans de nombreux pays européens, le caractère redistributif de plusieurs instruments de la politique familiale risque de décourager l'offre d'emploi des mères. Par conséquent, il apparaît essentiel de créer un set cohérent d'instruments de politique familiale pour en même temps prévenir les familles de la pauvreté et encourager l'emploi des mères et la fécondité.

