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The Division of Labour Within Households: Fractional Logit Estimates based on the Austrian Time Use Survey

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Abstract:
The allocation of paid and unpaid work within households strongly depends on the household members' individual characteristics. The most important of these characteristics is gender, followed by education and parenthood. Despite the significant increase in women's labour market participation in the last decades, they still perform 73 percent of housework and 79 percent of childcare in 2008/09.
This paper studies the determinants of the persistent division of labour within households with a new approach that combines standard absolute measures of time use with the relative measure of time use shares. This approach allows for a better understanding of the division of labour and the influence of the household member's characteristics on these allocations. The empirical analysis relies on the Austrian time use survey conducted in 1992 and 2008/09. To appropriately account for the complex structure of time use data, the fractional logit model is applied for predicting shares, and a Poisson-gamma model is introduced for estimating total amounts. Hereby, the complex dynamics of task allocation can be studied in Austria for the first time.
The results indicate for the last two decades that there has been an overall increase in the time devoted to market work and childcare, but also that there has been a total decrease in housework. The latter may be explained by an increase in outsourcing work, due to gains in productivity, or because work is simply left undone. The results of the study also show that the higher women are educated, the more balanced paid and unpaid work are within households. On the contrary, parenthood increases female specialisation into unpaid work. Lastly, the results indicate a slight relaxation of gender roles over the last 20 years, however, the segregation of paid and unpaid work still persists.

Keywords: Division of Labour, Unpaid Work, Female Labour Market Participation, Fractional Logit Model, Poisson-gamma Model, Childcare, Housework, Gender Roles, Time Use

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Contents

1 Introduction

The allocation of paid and unpaid work within households strongly depends on the household members' individual characteristics. The most important of these characteristics is gender, followed by education and parenthood. There has been little change regarding the division of labour within households in the last decades. However, there was a significant increase in women's labour market participation. This shift towards paid employment for women has been one of the major social changes in advanced societies (Baxter et al., 2005). In Austria alone, female labour market participation has increased from 61 percent in 1994 to 69 percent in 2009 and has continued rising each year thereafter (Statistik Austria, 2016). Along came an overall decline in time devoted to unpaid work, and a slight convergence within households. Notwithstanding, women still perform 73 percent of housework and 79 percent of childcare as of 2008/09. The gains women have made in the labour market have not been fully translated into the private sphere. Research suggests that the notion of within-household-specialisation has significant consequences on women such as diminishing their career opportunities, penalising their wages, and possibly explaining the prevailing low birthrates (De Laat and Sevilla-Sanz, 2011; Sevilla-Sanz et al., 2010).

Theory provides several explanations for the persistent segregation of tasks between men and women. Economic approaches focus mainly on the individual resources of household members, such as human capital and income, to explain the gap. By contrast, sociological viewpoints consider social norms and institutions as major determinants. Other explanations suggest that the division of labour depends on the structural framework provided by national policies, culture, and norms. However, this paper focuses on micro level determinants rather than macro level determinants. As a consequence, the observed unit is the household and its members' individual characteristics instead of countries and their peculiarities.

This paper aims to carve out the main determinants of the division of labour within Austrian households. A large body of literature on this topic is concerned with time devoted to unpaid work, however, most contributions only consider the total amount of time dedicated to specific time categories. The present analysis employs a different approach by also considering each

household member's share of those activities. By operationalizing the response variable as a fraction, it is possible to account for within-household interdependencies that determine the division of labour. It considers for example, that certain tasks only have to be carried out once per day in each household and that the household members' characteristics influence their allocation. As such, the allocation of tasks and its determinants can be understood better. This combination of a relative and an absolute approach allows the complex underlying dynamics, which have not yet been studied for Austria, to be accounted for.

The empirical analysis presented in this study relies on diary-based data from the Austrian time use survey conducted in 1992 and 2008/09. This data provides detailed information on individuals' time patterns for over 30,000 observations. Yet, it does exhibit a number of complications. First, the underlying process generating time use data is complex and as a consequence varies strongly by subgroup and activity. Second, the data includes many zeros, resulting in a right-skewed distribution with mass point at zero in the case of total amounts, and mass points at zero and one in the case of shares. To appropriately account for the special structure of the data, the fractional logit model is applied for predicting shares. Furthermore, a Poisson-gamma model is introduced for estimating total amounts in order to provide additional context.

This paper begins by reviewing the literature, with a specific focus on current theoretical and empirical approaches (chapter 2). Informed by this survey, possible hypotheses for the empirical analysis are proposed. The empirical analysis is organised into a descriptive analysis (chapter 3) and an econometric analysis (chapter 4). The descriptive analysis first introduces the Austrian time use survey and then presents results. The econometric analysis begins by discussing possible estimation methods and then explaining the chosen methods in detail. Subsequently, it provides the model specification and describes the variables of interest. Finally, it presents the estimated results with a detailed interpretation and evaluation. This paper concludes with a summary and suggestions for further research (chapter 5).

2 Literature Review

This Chapter provides an overview on topical literature. Firstly, relevant theoretical approaches are summarised and their explanatory capabilities are evaluated. Secondly, current empirical research concerning the division of labour are examined. Each section concludes with possible hypotheses for the empirical analysis in chapter 3 and chapter 4.

Throughout this study, the term *paid work* is used to denote formal work conducted in the labour market that generates income. The term *unpaid work* is divided into two categories, namely housework and childcare. The category *housework* includes activities[1] such as cooking, cleaning, gardening, maintenance, repair work, and household management. The category *childcare* includes inflexible routine tasks such as feeding or washing children, as well as relatively flexible non-routine tasks such as playing with children.

2.1 Theoretical Approaches

In the following subsections, three streams of theory are presented: *human capital theory*, *bargaining models*, and *models based on norms and institutions*. All of them attempt to explain how partners share paid or unpaid work between them, and why there is an imbalance between genders in terms of paid and unpaid work. In consideration of the empirical analysis presented in section 3 and 4, which will take on a micro-level approach, the theoretical foundation focuses on micro-level theory as well. The section consists of economical and sociological arguments, interpreting the underlying dynamics of the division of labour within households. While economic theory mainly explains specialisation building upon the household members' individual characteristics such as human capital or resources, sociological viewpoints consider social norms, and institutions.

2.1.1 Human Capital Theory

In human capital theory, the partner's comparative advantages can explain the allocation of paid and unpaid work within the household (Kitterød and Lappegård, 2010). Rationally behaving individuals (Klaus and Steinbach,

[1] An overview of the observed activities is provided in the appendix.

2002) maximise a joint household utility function by dividing work with respect to both partners' marginal productivity Kitterød and Lappegård (2010). Hence, the spouse with higher earning capacities proceeds to do more market work and the spouse with less resource capacities stays at home (Craig and Mullan, 2011).

The theory traces back to Gary S. Becker who compared households to a small factory, in which every individual specialises in the task he or she can fulfil the most efficiently (Becker, 1985; Haberkern, 2007). Hence, relative resources determine who does unpaid work and who does paid work. In specific, their human capital and consequently their market income decide who stays at home since it is considered rational that the individual with the higher hourly wage and therefore higher opportunity cost works at the market. Therefrom, the division of labour is at least partly determined by the market (Becker, 1985, 1991; Haberkern, 2007). Hence, human capital theory acknowledges that different forms of capital are needed for different tasks inside and outside the market Ravanera and Beaujot (2009). In principle, Becker's approach is indifferent regarding gender, since the allocation of work is only determined by an individual's hourly wage and human capital. Nonetheless, Becker argues that the large differences in paid and unpaid work between genders are due to women's biological advantages in terms of childcare (Becker, 1991; Haberkern, 2007).

So far, the theory implicates that the person with more human capital does less unpaid work. Yet, an increase in a person's income does not necessarily mean that the partner takes over the tasks that are not being fulfilled anymore. The increase in opportunity costs could also result in outsourcing rather than a different allocation between partners:

> "the substitution towards goods induced by an increase in the relative cost of time would often include a substitution towards more expensive goods. For example, an increase in the value of a mother's time may induce her to enter the labour force and spend less time cooking by using pre-cooked foods and less time on child-care by using nurseries, camps or babysitters" (Becker, 1976, 110).

While human capital theory predicts a negative effect of a person's human capital on his or her partner's share in market work, the social capital perspective expects the opposite: The spouses' labour supply might be positively correlated, because they can help each other with skills, resources, knowledge, and networks (Kitterød and Lappegård, 2010). For example, a well networked person might arrange a job for his or her partner. Or else, well educated couples might stimulate each other to acquire even more human capital. This approach is closely related to the concept of assortative mating, which states that individuals with a similar income or education level are more likely to end up in a relationship. For example, assortative mating has increased in the U.S. from 1960 to 2005 (Greenwood et al., 2014), indicating that it is beneficial and desirable for individuals to be with someone of their level of human capital.

Conclusively, human capital theory predicts a positive effect of a woman's human capital on her participation in the labour market. Yet, it is not possible to say whether this is only due to women working more on the market, or also due to man working less. Men's human capital is most likely negatively correlated with women's share in paid work. With respect to unpaid work, the theory predicts that women's share decreases once her human capital increases. Yet, once again it is unclear whether this is due to her doing less only, or also due to her partner doing more unpaid work. Furthermore, the share could go down due to outsourcing. However, even though outsourcing might be easy with housework, it is less simple with childcare. Craig (2006a, 260) summarises that "delegating the care of children is more potentially problematic than outsourcing other domestic tasks [...] care giving is a complicated mixture of work and love, in which the relationship itself is of great importance ".

Given that women's education, labour market participation, and wages have risen considerably in the last decades, human capital theory fails to explain the persistence in the unequally allocated unpaid work within households (Sevilla-Sanz et al., 2010).

2.1.2 Bargaining Models

Bargaining models also build upon the idea of relative resources determining the allocation of paid and unpaid work within households. Yet, contrary to human capital theory, it is assumed that the decision making process is based on conflicts rather than agreements and rationality. By bargaining, both spouses try to maximise their individual utility instead of their joint household utility.

The approach considers that not only human capital is unequally distributed within households, but also power (Sevilla-Sanz et al., 2010). Hence, it acknowledges that the allocation of work is not only determined by the market. In those models, unpaid work is considered as unpleasant, hence, individuals try to bargain their way out of it. The more bargaining power one spouse has, the easier it is to avoid unpleasant tasks for him or her Baxter (2002); Deding and Lausten (2006); Haberkern (2007); Klaus and Steinbach (2002); Lachance-Grzela and Geneviève (2010).

Sources of power are the partners' individual resources (Craig, 2006b); they can be of socio-economic or demographic kind. High education, income, or a good position in the labour market increase bargaining power (Kitterød and Lappegård, 2010). However, also soft-variables like love, interest into the relationship, or possible alternatives to the relationship have an influence on the bargaining outcome (Haberkern, 2007; Klaus and Steinbach, 2002; Sevilla-Sanz et al., 2010). Those variables can also interact whit each other: If one has a higher level of education or income, he or she might be less dependent to the relationship and also more powerful in bargaining situations. Children might increase both partners' interest in the relationship, because they cause higher psychological, sociological, and legal costs of separation. The same counts for marriage. Hence, divorce can be a powerful threat point (Klaus and Steinbach, 2002).

The bargaining model's implications for the empirical analysis' outcome are similar to the ones from the human capital theory. The more educated women are and the higher their income, the smaller their share in unpaid work. Furthermore, it is expected that children and a couple's marital status, will alter the results. Yet, the predictions of the bargaining model regarding

their effect are not clear. The effect on childcare is also not straightforward. Firstly, childcare might be considered as something pleasant, hence, one bargains into childcare rather than out of it. Secondly, parents might feel obligated to spend even more time with their children if they do a lot of market work, so that they do not miss out (Craig and Mullan, 2011). Conclusively, the bargaining model is an enriching addition to the human capital theory, because it considers power inequalities within households. Yet, it fails to explain why women do more unpaid work, even if the resources are similar to their spouses'.

Some variations of the bargaining model consider gender norms. If no agreement can be achieved in the bargaining process, individuals fall back on socially defined gender roles. Subsequently, women clean and fulfil care tasks whereas men do paid work (Haberkern, 2007). This extension of the bargaining model traces an arc to models based on norms and institutions, discussed in the next subsection.

2.1.3 Theories Based on Norms and Institutions

The theories discussed in this subsection are based on the idea that individuals are socialised into male and female gender roles. For example, the "symbolic construction of housework as women's work and as a display of women's love for her family and subordination to her husband" (Baxter et al., 2005, 589) and the male breadwinner who has to support his economically inactive wife (Craig, 2006b). Hence, the approach acknowledges that the allocation of time is not only determined by relative resources, but also by the psychological and sociological aspects of identity (Sevilla-Sanz et al., 2010) which leads to individuals reproducing society's norms (Deding and Lausten, 2006). In other words, "to make cognitive sense out of the world, individuals behave in ways that they can explain to others, and this leads them to follow others' expectations, including those to gender" (Bittman et al., 2003, 191). Hence, women avoid activities with a masculine connotation such as repair work or buying a car, and men do not fulfil tasks with a feminine connotation such as cleaning and decorating (Kitterød and Lappegård, 2010).

In this theoretical stream, people do not fulfil tasks because it increases their

individual or the household's utility, but because they feel morally obligated to do so (Craig, 2006b). Consequently, women might do more housework because "the cleanliness of one's home is a reflection on a 'wife and mother' " (Bianchi et al., 2000, 195). Marriage, as an institution, might involve even stronger roles, predicting an even larger gap in paid or unpaid work between spouses (Bianchi et al., 2000). The direction of the relationship between norms and the allocation of tasks is not clear. It could be that the more modern a couple's or society's gender attitudes are, the more equally shared are paid and unpaid work within households. Yet, it could also be that a couple's attitude towards gender equality is a consequence rather than a cause of the division of labour (Kitterød and Lappegård, 2010).

Some variations of the theory go one step further and suggest that women do even more unpaid work if their share in market work increases, just to correspond to the image proposed. This could explain why housework is still mainly performed by women, even though female labour market participation has increased. Bittman et al. (2003) find empirical evidence for that, showing that women do even more housework once they earn more than their partner, which is why they conclude that gender trumps money.

Closely related to the theories described above is the gender gap in paid and unpaid labour due to differences in occupation. Men and women have different kinds of jobs with different work-cultures. Jobs typically done by men often have longer hours, while jobs done by women often involve part-time agreements (Kitterød and Lappegård, 2010). In Austria in 2015, 47.4 percent of all women participating in the labour market work part-time, while only 11.2 percent of working men do so. What is more, while most men work full-time throughout their working life, women, especially mothers, often have periods of part-time employment. Furthermore, 8.9 percent of all occupied Austrian men, but only 3.8 percent of all occupied women hold – time consuming – leading positions (Statistik Austria, 2015).

Taken all together, relative resources, power and gender roles all seem to be powerful predictors of the division of labour within households. In response to the three streams of theories discussed, it is expected that individual education and income are important determinants of the share of paid and unpaid labour within households. A women's education is most

likely positively correlated with her share in paid work because it increases her opportunity cost of staying at home. It might further lower her share in housework, either because her partner takes over or because she outsources tasks. The effect on her share in childcare, however, is ambiguous. Following human capital theory, her fraction is likely to decrease when she gains higher education. In the bargaining model, it depends on whether childcare is considered pleasant or not. Assuming that higher education fosters a positive attitude towards gender equity (Bittman and Pixley, 1997; Brooks and Bolzendahl, 2004), schooling is likely to decrease the share of both, childcare and housework, when considering the sphere of norms and institutions. On the contrary, educated mothers might be particularly concerned with their offspring's acquisition of human capital and consequently spend more time with them than less educated mothers. Additionally, they might be more likely to afford staying at home with their children for a longer period of time (Craig, 2006b). Either way, it is expected that besides education, children are an important determinant of the division of labour.

Men's education is expected to be negatively correlated with women's share in market work when following human capital theory or the bargaining model and positively correlated when following social capital theory. The effect on housework is also not clear. Men's education might either increase women's housework, because men specialise in market work due to comparative advantages or because their education helps them to bargain out of housework. On the contrary, higher education could alter their attitude towards gender equity, hence decreasing women's share in housework. The same holds for the effect of men's education on childcare.

Another possible predictor derived from theory is a couple's marital status. Firstly, marriage increases the cost of separation, hence it decreases bargaining power of the person having more interest in the relationship. Secondly, along with marriage come stronger role models that might increase women's share in unpaid work and men's share in paid work. Furthermore, gender roles might be more distinct in rural areas than in the city; hence the size of the municipality a couple lives in could also be an important predictor. Finally, the theoretical analysis implies that the division of labour has become more equal over the last decades. Research indicates that attitudes towards gender equity have gotten more modern over time (Brooks and Bolzendahl,

2004); thus changing norms and gender roles might cause a more equal allocation of paid and unpaid work within households. However, this trend might be mitigated by the fact that behaviour and attitudes with respect to gender equity are likely to drift apart (Bittman et al., 2003).

2.2 Empirical Approaches

This section reviews relevant empirical contributions concerning the allocation of paid and unpaid work within households. That said, many of the examples in the literature do not provide evidence for the division of labour directly. Most of the research conducted only focuses on total amounts of paid and unpaid work instead. Given that total amounts can be an enriching addition to fractions, this section concerns both specifications. The studies presented use different kinds of estimation methods, mostly Tobit and ordinary least square (OLS) models. A discussion regarding estimation methods can be found in section 4.1.

Craig (2006a) has observed childcare in Australia in 1997 and found that gender is the single most important predictor when it comes to childcare. Even if men and women share all other characteristics – including full-time market work – mothers spend more time in childcare than fathers. What is more, childcare performed by women is different than childcare carried out by men. By distinguishing different types of childcare, Craig (2006a) was able to account for the fact that some tasks are more demanding or pleasant than others. She further differentiates between primary and secondary activities. The term secondary activities refers to activities conducted additionally to the main activity, hence multitasking. For example, a person could be cooking as a primary activity, while supervising a child doing homework as a secondary activity. Taking everything into account, the author concludes that mothers spend more time on childcare in absolute and in relative terms. Furthermore, they perform more physical childcare, with a more rigid timetable, spend more time alone with their child, and have the overall responsibility for managing care. On the contrary, fathers spend relatively more time playing and talking to their children, a task that does not have to be done frequently or at specific times. It is further mentioned that women's lack of flexibility regarding childcare is likely to reduce their career options. Craig's analysis is based on dependent variables specified in

absolute terms, hence, interdependencies of men's and women's contribution and individual characteristics are not being accounted for.

The study's results are confirmed by Craig and Mullan (2011) for Denmark, Italy, and France and, once again, Australia. By analysing more than one country, it is possible to take into account cross-country differences in policies, institutions, and attitudes. This time, the dependent variable is a share. Specifically, the authors are estimating several models with different ratios as the response variable. The first group of models predicts the ratio of routine as well as non-routine tasks to total hours of childcare provided by the couple. This is done separately for men and women. Routine tasks refer to frequent, time-consuming, and non-flexible activities such as feeding children or putting them to bed. Non-routine tasks include talk-based activities such as talking to children or playing with them. The latter does not have to be performed at a certain time. The second group of models predicts the ratio of tasks conducted alone, respectively with the partner being present, to overall childcare. The authors found that "even in the most egalitarian household type [...] in the most egalitarian country (Denmark), mothers carried out much more of the care than fathers" Craig and Mullan (2011, 853). Yet, Danish men did slightly more routine childcare than the others. This indicates that cultural norms and institutions do have an effect on the division of labour, giving credits to theories acknowledging norms and institutions mentioned in section 2.1. It is further confirmed that also in the three European countries, mothers do more routine care and are more often alone with their children than fathers.

Baxter (2002) observes both, the total amount of time per person devoted to unpaid work, as well as the share within households. The analysis relies on questionnaires rather than diary data – the differences are discussed in section 3.1. By observing the Australian time use surveys of 1986, 1993 and 1997, she did find convergence of the share of unpaid work within households. Yet, this decline in specialisation is due to women spending less time on domestic work, rather than men spending more. Conclusively, the analysis shows that there have been changes in the allocation of time over the years. The same holds for an analysis by Baxter et al. (2005), who also found a slight convergence of domestic labour within Australian households over time. (Klaus and Steinbach, 2002), however, came to the opposite con-

clusion when observing the convergence of paid and unpaid work in German households from 1988 to 1994. They found that the division of labour was rather persistent over time and that the allocation of unpaid work hardly reacts to variables such as women's occupation. Because the German TUS back then was still based on questionnaires, their response variable is an index, indicating whether the man or the woman does more unpaid work or if both do roughly the same amount.

Sevilla-Sanz et al. (2010) predicted women's shares of unpaid work in Spanish households in 2002/03 and found that women specialise in childcare, independent of whether their relative productivity or bargaining power is high or low. Specifying their independent variables as fractions makes it possible to observe interdependencies within couples. Haberkern (2007) also tested the allocation of work within households directly, by using the difference of both partner's time devoted to housework, childcare and other care as the dependent variable. Hence, values greater than zero indicate that the woman spends more time with unpaid work than the man. Negative values indicate the opposite. His analysis relies on data from the German time use survey of 2001/02. Here, individuals fill in a diary at three different days. Conveniently, the German TUS includes information regarding the individuals' and the household's income, making it possible to test resource related theories more sophisticatedly. He finds that firstly, hourly wages, income, and financial dependency do have an influence on the share within households. Secondly, he finds support for the idea that women do even more housework if they gain the principle income. This supports the idea mentioned in section 2.1 that women try to fulfil a certain image. One more interesting aspect of Haberkern's analysis is that German men stay in paid work, even when their partner is dependent on care. While women take over care in the event of their spouse becoming dependent on care, men are more likely to outsource such tasks.

So far, evidence was found for gender and time being important predictors for the division of labour. Craig (2006b) shows that education is an important determinant as well. Once again , her analysis is based on the Australian time use survey. By operationalizing the dependent variable as the total amount of time devoted to childcare, she finds that the better educated fathers are, the more time they spend with their children. Furthermore,

they are more likely to spend time alone with their offspring. However, the same is true for women: they also spend more time with their children, the better educated they are. Conclusively, one can expect that education does not have a big effect on the allocation of childcare, given that assortative mating will cause people with similar education levels to end up in a relationship. However, following Craig's analysis, education is expected to influence the total amount of childcare performed in a household.

Sayer et al. (2004) adopt a somewhat different approach observing division of labour, namely a composition analysis. They want to know if hours in paid work in the U.S. between 1980 and 2000 have changed due to a shift in demographic characteristics or because of a shift in behaviour. This is possible by assuming the same family and human capital characteristics for both years observed, thus filtering out behaviour. In the time frame observed, family and human capital characteristics had changed: couples marry later and have children later, they are better educated and more likely single. These changes in population structure might have an effect on patterns in time allocation. However, at the same time, a cultural and social transformation might have happened. It is more socially acceptable for women to work and study as well as for men to cook, clean, and take care of children. Also, housekeeping standards might have gotten more relaxed. They found out that taken together, the difference between 1980 and 2000 is much bigger for women. Their involvement in paid work has increased on average by 509 hours per year. Half of the increase can be explained by a change in characteristics (+ 241 hours), and half of it by a shift in behaviour (+268). Men's time devoted to paid work, however, only increased by five hours. Interestingly, the shift in behaviour caused men to work 39 hours less each year. However, this effect was outweighted by an increase of 44 hours due to a shift in men's human capital and family characteristics. One can interpret the behavioural shift as a change in norms over time, while demographic characteristics such as education, refer to resource related theories.

Bianchi et al. (2000) also conducted a decomposition analysis, namely for housework in the U.S. for 1965, 1975, 1985 and 1995. Their analysis shows that the time men devote to housework has increased in that time by a third, and that most of the increase is due to changes in their behaviour rather

than changes in demographic characteristics. At the same time, women have decreased their time spent on housework by more than 50 percent. Hence, housework within the household converges, but mainly because a lot of housework is left undone. She concludes that

> ”ironing may seem more boring or onerous, and wrinkle-free clothing may be less important to women (and men) and to the culture in general. Indeed, the lore regarding mid-twentieth-housewives, who ironed even the sheets that the family slept on, may indicate that in midcentury there was an overvaluation of housework, with standards now more in line with Americans’ preferences for how to spend their time” (Bianchi et al., 2000, 218).

Taken together, this literature review allows for the following summary: Gender seems to be the single most important predictor for the allocation of tasks within households. Additionally, the level of education of both men and women can explain differences in the division of labour. Furthermore, paid and unpaid work seem to converge over time. Mainly, because women seem to have reduced their time devoted to unpaid work, respectively increased their time devoted to paid work, and because both genders have changed their behaviour. Yet, gender segregation of tasks continues. Conclusively, there is evidence in the literature for all three streams of theory presented – the human capital theory, the bargaining model, and models based on norms and institutions.

3 Descriptive Analysis and Data

The design of the empirical analysis presented in the next two chapters is based on the insights gained from the previous sections. To appropriately account for interdependencies within households with respect to the division of labour, the main focus lies on shares of times rather than total amounts. However, total amounts of time categories are considered whenever they provide valuable context. Based on the theoretical and the empirical literature review, the descriptive analysis (section 3.2) and the econometric analysis (chapter 4) differentiate between gender as well as couples with children and without children, thereby acknowledging that those subgroups are highly heterogeneous. The main predictors of interest are education and

the survey year. Unfortunately, education is the only way resources can be measured, since the Austrian TUS does not provide information regarding individuals' or households' income and wealth.

This chapter – dedicated to the data utilised and the descriptive analysis – is structured as follows: Firstly, the Austrian TUS will be introduced, the analysed subsamples will be described and the time categories of interest will be defined. Following this, the descriptive statistics are presented.

3.1 Data: The Austrian Time Use Survey

The present empirical analysis relies on data from the Austrian time use survey (TUS), conducted by the Austrian Statistical Office (*Statistik Austria*) as a special programme of the micro-census in 1981 and 2008/09. It contains information on how individuals spend their time, as well as demographic and socio-economic variables. In 2008/09, every participant of the micro-census above the age of 10 was asked to fill in a time diary to record his or her day. In 1992, every second proband was asked. While participation in the micro-census is mandatory, it is voluntary for the TUS. In 2008/09 probands received an alarm clock as a thank-you gift (Statistik Austria, 2011).

The statistical base population for the surveys was Austria's resident population older than 10 years old, hence approximately 7.4 million individuals in 2008/09. Institutions like refugee camps, nursing homes, or prisons were excluded from the surveys. The dataset from 1992 includes 25,233 individuals from 12,169 households (Statistik Austria, 1992a) and the most recent dataset from 2008/09 includes 8,234 individuals from 4,757 households. The latter had a gross random sample of 12,422 households, resulting in a response rate of 38.3 percent (Statistik Austria, 2011).

Participants were asked to fill in every activity lasting longer than 15 minutes over a time frame of 24 hours. For this purpose, they were provided with a pre-designed diary which had slots of 15 minutes from 5 am to 11 pm and slots of 30 minutes from 11 pm to 5 am. In 1992, the diary started at midnight (Statistik Austria, 1992b), in 2008/09 it started at 5 am in the morning (Statistik Austria, 2011). In those diary-slots, participants wrote,

in their own words, what they were doing at each particular time. Additionally to the main activity, contributors had to give the provide information (Statistik Austria, 2009):

- The participants had to declare the exact date of the fill-in-day.
- Furthermore, they had to declare, who filled in the diary (the person him- or herself, another household member, or an interviewer).
- Also, a self-assessment of whether the fill-in day was an ordinary or extraordinary day was required (this information was only collected in 2008/09).
- If so, the contributors had to fill in the reason for why it was an extraordinary day (the proband had holidays, was sick, on a journey, or other reasons).
- Information on the place at which the activity was conducted (in the household or somewhere else) was also collected.
- If feasible, it was further required to fill in whether the activity was done for their own household or for another household.
- Moreover, the Austrian Statistical Office collected data on whether another person was present when the activity was conducted (the participants' partner, their child below the age of 10 years, another household member, or another acquaintance).
- Finally, the participants had to fill in if a secondary activity was conducted at the same time as the main activity.

Declaring secondary activities makes it possible to observe multitasking. For example, a proband might record reading as a primary activity and listening to music as a secondary activity, or cleaning as a primary activity and helping a child doing homework as a secondary activity.

The most recent study was being conducted from March 2008 to April 2009, thus including five quarters. The fill-in day was randomly assigned and at least one diary was filled in every day, therefore covering all 356 weekdays and weekend-days of the year (Statistik Austria, 2009). In 1992, the survey was only conducted in two quarters, starting in March respectively Septem-

ber (Statistik Austria, 1992a). Even though activities are expected to differ between the seasons, no crucial seasonal differences were found in the data (Hammer, 2012).

The survey of 1992 was not the first one carried out in Austria. Three surveys had been conducted so far, the first one in September 1981. In contrast to the two recent studies, it was designed as a questionnaire. Individuals were asked about the previous day by an interviewer, who asked questions such as: "How much time did you spend on leisure?". The survey only aimed for household members above the age of 19 and did not collect additional information such as secondary activities (Statistik Austria, 2009). The survey of 1981 has not been included in paper for two reasons. Firstly, due to its design it is not comparable to the samples of 1992 and 2008/09. It consists of answers to questions rather than aggregated time categories, it was only conducted in September, thus not accounting for seasonal effects, and it does not provide necessary additional information. Secondly, diaries are considered more precise and reliable than questionnaires (Bianchi et al., 2000; Lachance-Grzela and Geneviève, 2010; Statistik Austria, 2009). The diary-form and the fact that participants can fill it in as they go make it easier to remember short-duration activities (Statistik Austria, 2009) and to differentiate between primary and secondary activities. For example, Bianchi et al. (2000) found that individuals declare 50 percent more unpaid work in questionnaires than in diaries in the U.S.. Furthermore, individuals tend to underestimate how much time they spend on personal time. Due to those drawbacks, the Austrian Statistical Office opted for the diary methodology for the 1992s and 2008/09 survey (Statistik Austria, 2009). Accordingly, the 1981 survey is excluded from this paper too.

Even though time use surveys based on the diary methodology are considered very reliable, (Bianchi et al., 2000; Craig, 2006a; Lachance-Grzela and Geneviève, 2010) they are not without flaws. Perhaps the most serious drawback of this method is that participation is voluntary. Consequently, individuals with a high time burden might be less likely to participate in the survey, since filling in a diary takes time itself. Furthermore, it might be harder to convince people with low education levels to contribute. Non-citizens and employed singles are also likely to be under-represented. The latter, because it is harder to catch them when they are at home, since they

are the only household members (Statistik Austria, 2009). Another weakness is that each individual fills in the diary only at one single day. Many activities are not conducted on a daily basis, for example, because partners alternate with preparing dinner. Hence, the data includes many zeros. Section 4.1 lays out how those zeros are handled in the present paper. Also, given that the sample is cross sectional, it only provides a snapshot in time rather than longitudinal information (Craig, 2006a). Another shortcoming is that the surveys of 2008/09 and 1992 contain different interpretations of an individual's occupation status (Hammer, 2012). However, occupation is not included in the final outputs of that paper, hence, this issue is negligible. Also, the 1992 sample does not allow for an appropriate control for migration background. Finally, the fact that the Austrian TUS does not collect information regarding the individual's and household's income and wealth makes it impossible to account resource related theories directly.

3.1.1 Time Categories

As regards the original sample of the Austrian TUS, the Austrian Statistical Office scanned the filled-in time diaries and coded the slots into over 300 different activities[2] in 2008/09 and over 200 activities in 1992. Missing values were not imputed. If a household member did not fill in the diary, he or she was left out in the TUS. However, semi-finished households were not dropped. Consequently, it is possible that in one household, everyone had to participate in the micro-census, but only some members appear in the TUS sample. If slots were left out or not clearly marked, they were added to the category *time without clear association*. The Austrian Statistical Office also evaluated the diaries with plausibility checks to ensure their feasibility. For example, showering for 24 hours would not be considered feasible (Statistik Austria, 1992a, 2009, 2011).

For the present paper, the activities provided by the Austrian Statistical Office were further aggregated into five different time categories. The Austrian TUS' original activity-categorisations vary slightly from 1992 to 2008/09. However, this does not affect this paper, since those differences disappear once the activities are aggregated into the five time categories. The new categories are *personal time*, *leisure*, *housework*, *childcare*, and *market*

[2] An overview of all activities is provided in the appendix.

work. Personal time includes activities such as sleeping, showering, and eating. Leisure includes hobbies, sports, cultural activities such as going to a concert, the use of media such as watching TV, voluntary work, and social interaction like meeting friends. Housework contains tasks like cooking, cleaning, gardening, shopping, repair work, and managing housework. Childcare includes routine tasks such as feeding and washing children, as well as non-routine tasks like reading stories to them or talking to them. Market work contains working in a regular occupation or side job as well as education and further training.

For this paper, travel time is only considered if it can unambiguously be associated with one of the five categories. Not included in the five new classes is unpaid work carried out by children living in the household. This would bias the results, since the main object of interest is the allocation of work by couples. Furthermore, care for other household residents apart from children is eliminated, because it is defined differently in the two surveys and thus not comparable. Yet, taken all together, the five time categories utilised in this paper still cover 99,5 percent of a man's average day in 2008/09. Hence, 7 minutes of 1440 minutes per day are not included in one of the five classes. For women, 99,3 percent of their average day is covered by the categories, thus ignoring 10 minutes per day.

3.1.2 Subsamples

Totalled up, both surveys provided by the Austrian Statistical Office consist of 33,467 observations from 16,926 households. However, not all of them are included in the empirical analysis of this paper. Since this analysis' main body of interest is the division of labour within households, only couples are considered. Specifically, married and unmarried heterosexual couples living together in the same household. The Austrian TUS does not provide information on homosexual couples. Furthermore, only households of which both partners participated in the time use survey are studied in this paper. This way, it is possible to calculate the total amount of time spent on a certain time category by that couple and to further identify which share each partner has in that amount. To make sure that no other adult household members – like grandparents – influence the allocation of time, only single family households are examined in this paper. For predicting shares, an ob-

servation is further dropped if both partners did not engage in the observed time category. Dividing zero minutes of time between them would result in a share of zero in that time category for both spouses and consequently provide misleading information.

Furthermore, individuals are only included in this paper if they are between the age of 20 and 54. This way it is accounted for the fact that people's time pattern change, once they grow older. For example, they do not have to trade off paid and unpaid work any more, once they are retired. Hence, their consideration would probably bias the results. The upper age limit of this paper is based on the international definition of the so called prime working age group, which includes individuals from the age of 25 to 54 (see, for example, OECD, 2011; Pasteels, 2012; Petreski and Blazevski Mojsoska, 2015, using these thresholds). However, that group's lower limit does not suit this papers' analysis since many families in the subsamples have children earlier already. Therefore, 20 years was chosen as the lower limit instead for this paper.

In the present paper, a household is considered to be a household with children, if at least one child is 19 years old or younger. To define this borderline of childhood stage, the Austrian legal framework from 1992 was taken into consideration. Back then, individuals were regarded full-aged once they turned 19. From 2001 onwards, individuals were considered full-aged at the age of 18 already (Universität Innsbruck, 2016). Yet, for the aim of comparability, 19 stays the threshold for both years observed. Foster children were excluded. As part of this work, it was further observed whether a child's gender has an effect on the allocation of work within households. For the creation of the binary variable *Youngest is a Girl* – which signals the gender of the youngest child – it was further necessary to exclude households in which the youngest child's gender could not be unambiguously identified. For example, if the youngest children were twins of different gender or a son and a daughter were born in the same year. However, the variable is not included in the final results in section 4.3 of this paper, since no statistically significant effect could be found.

The remaining – and thus the observed – sample of this paper includes 9,374 observations from 4,687 households. For the estimations, it is separ-

ated into two subsamples: The first one includes households with children, which covers 6,736 observations from 3,368 households. The second one includes households without children, which contains 2,638 observations from 1,319 households.

3.2 Results Descriptive Analysis

Following the description of the data, this section will present the first results, namely from the descriptive analysis. Figure 1 illustrates the average day of an Austrian couple in 2008/09. Only individuals between the age of 20 and 54 are considered. On average, both genders spend most of their time on personal time. Specifically, men spend 10 hours per day on personal time independently of whether they have children or not. Women spend slightly more and their allocation varies with parenthood, namely 10.4 hours if they are childless and 10.6 hours if they have children.

Furthermore, men spend 4.8 hours per day on leisure if they have no chil-

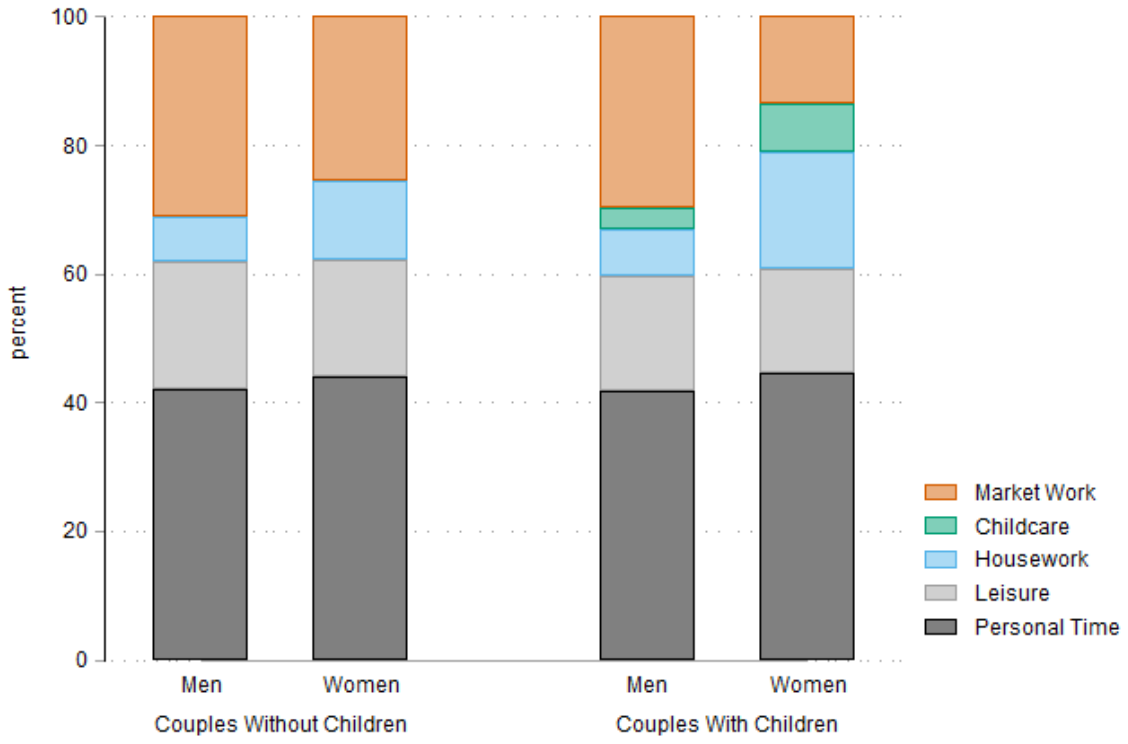

Figure 1: An Average Day for Couples in 2008/09

dren and 4.3 hours, if they have children. Women spend slightly less time on leisure than man, namely 4.3 hours per day if they do not have children, and 3.9 if they have children. Hence, couples without children have slightly more time for leisure activities than parents. This might be due to the definition of leisure, since, for example, *talking to a child* is considered childcare rather than leisure. Yet, figure 1 shows that neither personal time nor leisure vary much with respect to gender and parenthood.

On the contrary, men spend almost twice as much time in market work, than women. Overall, they engage in paid work for 7.2 hours per day, women only for 3.9 hours. When differentiating between couples with and without children, one can see that specialisation is even stronger when couples have children. Men devote 7.4 hours per day to market work if they are childless and 7.1 hours if they have children. The difference for women is much larger. They spend 6.1 hours on paid work if they are childless and 3.2 hours, if they are mothers.

Also, the amount of housework depends strongly on gender and parenthood: Women without children spend 2.9 hours a day on housework, women with children, however, spend 4.3 hours per day. Hence, not only childcare takes time away from market work. Once women become mothers, also housework increases relative to paid work. Men devote 1.7 hours to housework independently of parenthood.

Childcare is also unequally distributed between genders: While women spend 1.8 hours per day on childcare, men only devote 0.7. The specialisation is stronger, if a couple's youngest child is below the age of 3 years. Then, women spend 3.9 hours on childcare, while men still only spend 1.6 hours per day.

The ranking of time categories is the same in the 1992 sample as in the sample of 2008/09. This is visible in figure 2. Both, men and women, devote slightly more time on personal time in 1992 than they do in the 2008/09 sample: On average, men spend 10.4 hours per day on personal time and women 10.7 hours per day in 1992 – the results are independent of whether a couple has children or not.

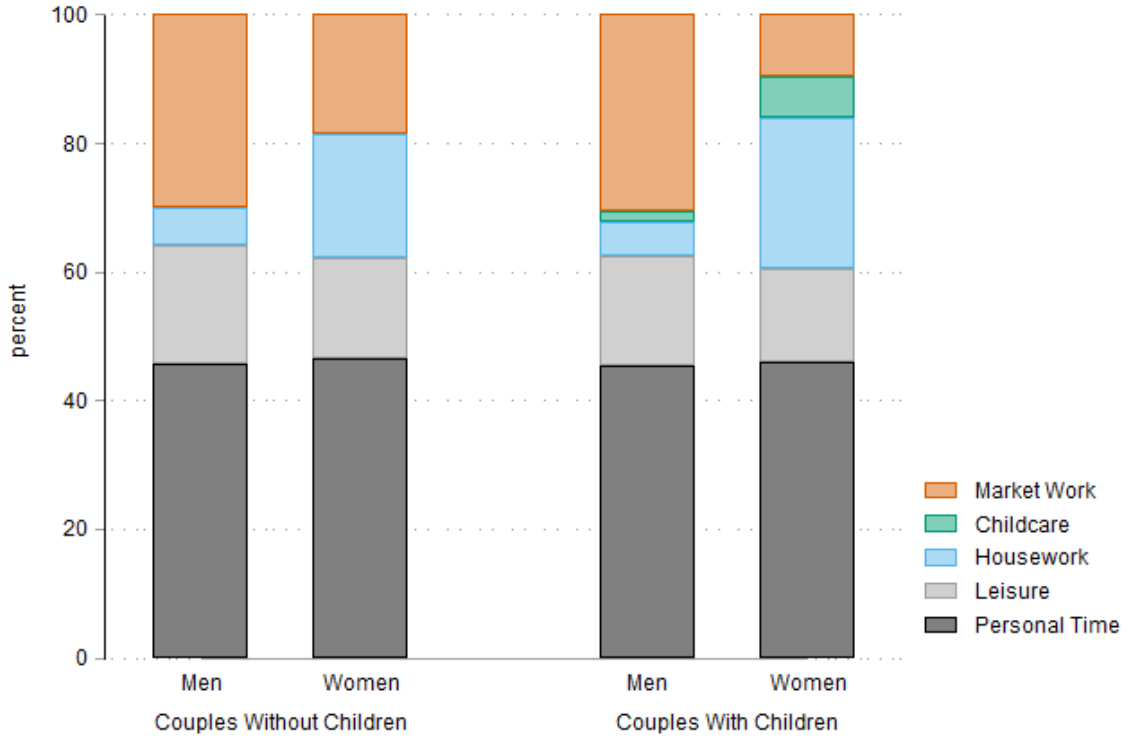

Figure 2: An Average Day for Couples in 1992

By contrast, couples spend less time on leisure in 1992 than they do in 2008/09. Men without children have 4.2 hours of leisure per day in the 1992 sample, fathers only 3.9 hours. Mothers have 3.6 hours of leisure when they are childless and 3.4 hours when they are mothers. In terms of variability, the results from figure 1 hold: Personal time and leisure are relatively stable with respect to gender and parenthood.

Specialisation of paid and unpaid work, however, is stronger in the 1992 sample than it is in 2008/09 sample. In households without children, men spend 6.9 hours on market work on average, while women spend only 4.3 hours hours on market work. In households with children, men's average time devoted to paid work increases to 7 hours while women's time decreases to 2.2 hours per day. Housework in 1992 decreases from 1.4 hours to 1.2 hours per day for men when they have children. For women however, it increases from 4.4 hours to 5.5 hours per day.

Conclusively, market work has stayed relatively stable for men from 1992 to 2008/09 while there was a huge increase for women. Similar patterns

Table 1: Women's Average Share in Market Work

	Childless	Children	Total
Education			
Compulsory	0.335	0.195	0.237
Apprenticeship	0.382	0.237	0.277
High School	0.425	0.231	0.289
Tertiary	0.427	0.310	0.336
Total	0.373	0.229	0.270
Year			
1992	0.355	0.205	0.248
2008/09	0.438	0.298	0.333
Total	0.373	0.229	0.270

can be found vice versa in housework: the amount of time women spent on housework has decreased strongly from 1992 to 2008/09, while men's hours have only increased a little.

Couples spend slightly less time with their children in the 1992 sample than they do in the 2008/09 sample. On average, men only spend 0.4 hours with their children in 1992 while women spend 1.5 hours. When the youngest child is below the age of 3 years, women spend 3.6 hours on childcare in 1992 and men 1 hour.

Table 1 reports women's shares in paid work, segmented into both survey years, different education levels and couples with and without children. The overall average share of women in market work is 27 percent. It was 24.8 percent in 1992 and 33.3 in 2008/09, thus indicating a slight convergence. Furthermore, the table illustrates a notable increase in average shares when women's educational attainment increases. The better educated a woman is, the more she participates in the labour market. For example, the share is 23.7 percent, if the woman's education is compulsory or less, but 33.6 percent, if she has a university degree. However, even if a childless woman's highest educational attainment is only compulsory or less, her share is still higher than that of a mother with a university degree. Childless women have an average share in market work of 37.3 percent, while mothers' share is only 22.9 percent.

While a woman's education is positively correlated with her share in market

Table 2: Women's Average Share in Housework

	Childless	Children	Total
Education			
Compulsory	0.803	0.843	0.831
Apprenticeship	0.755	0.810	0.796
High School	0.707	0.790	0.764
Tertiary	0.620	0.760	0.730
Total	0.759	0.814	0.799
Year			
1992	0.787	0.839	0.824
2008/09	0.661	0.748	0.726
Total	0.759	0.814	0.799

work, it is negatively correlated with her share in housework, as illustrated in table 2. On average, women with compulsory education or less performed 83.1 percent of all the housework, whereas women with tertiary education do 10 percentage points less, namely 73 percent. Having children causes a higher specialisation of women into housework. Childless women do 75.9 percent, mothers 81.4 percent. As in market work, there is a slight convergence in housework too. In 1992, women did 82.4 percent of all the housework In 2008/09 however, women did 74.8 percentage points, which leaves only 25.2 percent to men.

While market work and housework show a clear one-way relationship in terms of a woman's education, the interdependencies of education and childcare are less straightforward. As reported in table 3, the average share of women in childcare is 78.7 percent. In terms of education, women with compulsory schooling or less have the highest share in childcare, namely 81.7 percent. The share is the lowest, if a woman's highest educational attainment is a high school degree (75.0 percent) and slightly rises again, if

Table 3: Women's Average Share in Childcare

Education	1992	2008/09	Total
Compulsory	0.828	0.729	0.817
Apprenticeship	0.808	0.734	0.786
High School	0.777	0.712	0.750
Tertiary	0.800	0.691	0.751
Total	0.811	0.723	0.787

she has a university degree (75.1 percent). This ranking holds when only observing the 1992 survey, yet, the relationship between education and the share in childcare is different for 2008/09. Here, the share is highest for women who's highest educational attainment is an apprenticeship or similar and the lowest for women with a tertiary education. As with the other time categories, there was a slight convergence in specialisation from 1992 to 2008/09. However, men still only do 27.7 percent of childcare.

So far, predictions made in section 1 seem to hold: The allocation of work within households strongly depends on education as well as the presence of children. Women are more likely to participate in the labour market if they are well educated and childless. However, statements regarding childcare are less straightforward. There is no clear trend in terms of the effect of education on the share of childcare visible in the descriptive analysis. Statements regarding a convergence of work have to be made with caution. Shares got more equal from 1992 to 2008/09, however, the division of labour persists.

4 Econometric Analysis and Evaluation

This chapter is devoted to the econometric analysis of the division of labour within Austrian households. Firstly, possible estimation methods will be discussed and the ones chosen will be explained in more detail. Secondly, the model specification will be provided and the operationalization of the variables of interest will be laied out. Following this, the econometric results will be presented, interpreted, and, finally, evaluated.

4.1 Estimation Methods and Discussion

The division of labour within households is a prominent topic in the literature. However, not all contributions approach the peculiarities of empirically observing the allocation of time within households appropriately. The main two points of concern are firstly, the choice of the predicted variable, and secondly, the estimation method applied. In this section, the literature's contributions will be reviewed with respect to those two concerns.

Regarding the first concern – the choice of the response variable – it appears that most scholars choose to operationalise it in absolute terms and

per individual, hence, as the total amount of minutes or hours devoted to a certain activity per person (see, for example, Craig, 2006a,b; Sayer et al., 2004). Even though this approach can be insightful, it does not enable to observe interdependencies of both partners' individual characteristics and their effect on the division of labour within households. Only observing time use on an individual level ignores that some tasks only have to be done once per day for each household – cooking dinner for example. Those tasks are somehow allocated within households and its members' characteristics influence this allocation. Operationalizing the response variable as a share on the one hand, and controlling for both partners' individual characteristics on the other hand, allows to observe those dynamics. Education as an independent variable exemplifies, why it is important to account for both spouses' value-levels. Firstly, not only the man's but also the woman's education might influence the man's share in childcare. Secondly, the difference in education between both partners' might be more important in determining the allocation than the individual's level of education.

To overcome the shortcomings mentioned, the main part of the econometric analysis will predict shares – and hence the dynamics within households – rather than individual levels. Furthermore, those relative results will be put into an absolute context. Namely, by predicting the absolute amount of time devoted to an activity category in a household with respect to both partners' characteristics. This has never been done before with the Austrian TUS. The approach also follows a recommendation by Lachance-Grzela and Geneviève (2010, 770), who suggested that "using both absolute involvement and ratios of involvement would lead to a more complete understanding of the gendered division of housework".

Having discussed the first concern, this section now turns to the second one, which addresses the estimation methods applied. The next two subsections will discuss different estimation methods. The main challenges of estimating time shares, respectively amounts, will be laied out. The choice of the estimation models employed is based on that evaluation. Correspondingly, each subsection presents the estimation method finally applied. Specifically, the main part of the econometric analysis is based on the *fractional logit model* which is described in section 4.1.1.2. Additionally, a *Poisson-gamma model* is applied for predicting total amounts of time devoted to the time categories

of interest. It is described in section 4.1.2.2.

Before proceeding to the particular models, some general remarks: Both models applied belong to the group of generalised linear models, (GLM) which are used for non-linear response variables. The underlying idea with all those models is that the explained variable follows the probability distribution of one of the distributions from the exponential family, hence, either a Gaussian, a binomial, a Poisson, a gamma, an inverse Gaussian, a geometric, or a negative binomial distribution (Hardin and Hilbe, 2007). Furthermore, the models entail a link-function which relates the predictors to the fitted values (Wooldridge, 2009). In the case presented, the logit-function is used as the link-function. All GLMs have to be fitted with maximum-likelihood algorithms (Hardin and Hilbe, 2007). Hence, the values of the parameter estimates are fitted so that they maximise the likelihood of the empirical data (Wooldridge, 2009).

4.1.1 Predicting Shares

This subsection provides an overview on possible difficulties when estimating shares in the context of time use data. After discussing different approaches, the method of choice, namely the fractional logit model, will be presented in more detail.

4.1.1.1 Statistical Models for Estimating Shares

The division of labour is only rarely analysed by estimating shares. If so, OLS is frequently used to fit the model (see, for example, Craig and Mullan, 2011; Baxter, 2002). There are two possible drawbacks when using that method. Firstly, it might not consider the bounded nature of fractions appropriately. In the analysis at hand, the dependent variable is a share, hence, the variable's empirical values can never be below zero or above one. However, they possibly lie outside those thresholds if predicted with OLS (Baum, 2008; Ramalho and Ramalho, 2011). Secondly, the model assumes a linear effect from the explanatory variable to the response variable. Yet, in the present analysis, the effects are most likely not linear, making the OLS model a questionable choice for the current data. It may be a reasonable approximation for predictions close to the mean, but produce biased results

for the extreme values 0 and 1 (Brown and Dunn, 2011), which appear in high numbers in the current data observed.

Another popular method to estimate fractions is the Tobit model (see, for example, Sevilla-Sanz et al., 2010). One problem with that application could be that it does not correctly interpret the appearance of zeros, hence the data's lower limit. Tobit models assume that "the zeros represent censored values of an underlying normally distributed latent variable that theoretically includes negative values" (Brown and Dunn, 2011, 511). However, in the analysis at hand, zeros are not the outcome of censoring (Papke and Wooldridge, 1996). Instead, they represent corner solutions or emerge due to the sampling process Cardoso et al. (2010); Ramalho and Ramalho (2011) – one partner might simply not have conducted an activity on the survey day, while the other partner did.

Furthermore, fractions are frequently estimated by employing a logit transformation. Hereby, the fractions are predicted by applying a logit transformation to the shares and subsequently using OLS with the new variable as dependent variable. The transformation looks as follows:

$$y = ln\left(\frac{s_i^c}{(1 - s_i^c)}\right) \tag{1}$$

where s_i^c is an individual's share in time category c, and y is the new variable. However, the approach cannot handle the extreme values, 0 and 1 (Baum, 2008). Hence, it is not appropriate for the current case, since the fractional data has many 0 and 1 due to sampling zeros. Dropping or ignoring them could cause a truncation problem and possibly bias the results. One way to handle the data to make it fit the logit transformation is to apply *windsorizing*, where the extreme values are recoded. For example, 0 becomes 0.001 and 1 becomes 0.999 (Baum, 2008).

4.1.1.2 The Fractional Logit Model

For all reasons discussed above, the fractional logit model initially proposed by Papke and Wooldridge (1996) is chosen for observing the determinants of specialisation within households. It is capable of taking into account the

fractional nature of the explained variable, works for discrete and continuous variables (Papke and Wooldridge, 1996), and is capable of handling the extreme values of 0 and 1 without having to manipulate the data (Baum, 2008; Mullahy, 2010).

In the fractional logit model applied in the present paper, the dependent variable is operationalized as a fraction bounded between zero and one, $0 \leq s_f^c \geq 1$, specified as follows:

$$s_f^c = \frac{t_f^c}{t_f^c + t_m^c} \tag{2}$$

where c denotes one of the three categories of time use related to labour. Specifically, either market work, housework or childcare. The share's numerator in the analysis at hand is the time devoted to category c by the female partner. The denominator is the sum of the time devoted to category c by the female and male partner, hence a household's total amount of category c. The model proposed by Papke and Wooldridge (1996) has the following structure:

$$E(s_f^c|X) = G(\beta X_i) \tag{3}$$

where G(·) denotes the link-function satisfying $0 \leq G(\cdot) \geq 1$ and X_i represent a set of explanatory variables. The link function – in the case at hand the logarithmic-function – ensures that the predicted values of s_f^c lie in the interval (0,1). It can be written as follows (Wooldridge, 2009):

$$G(\cdot) = \frac{exp(\cdot)}{[1 + exp(\cdot)]} \tag{4}$$

GLM models are usually fitted with maximum-likelihood algorithms (Hardin and Hilbe, 2007). Papke and Wooldridge (1996) propose a particular quasi-likelihood method, which maximises the following Bernoulli log-likelihood function:

$$l_i(\beta) = s_f^c \; log \; [G(x_i\beta)] + (1 - s_f^c) \; log \; [G(x_i\beta)] \tag{5}$$

hereby following McCullagh and Nelder (1989).

4.1.2 Predicting Amounts

After having discussed the Prediction of shares, this section is concerned with the estimation of total amounts and concomitantly the peculiarities of time use data. After reviewing popular estimation methods for observing total amounts of time, the Poisson-gamma model will be presented in more detail.

4.1.2.1 Statistical Models for Estimating Total Amounts

When predicting total amounts of time, one has to account for the underlying data's structure and peculiarities. Time data is count data. It counts the amount of minutes or time slots devoted to a certain activity or activity category and hence, the observations can only take on non-negative integer values. Mostly, there are only a few values observed for each value-level[3]. Furthermore, the "data is nonnegative, often right-skewed and may contain a large share of observations reporting zero time in the activity" (Hammer, 2012, 1). The large amount of zeros can be classified into two different kinds. Firstly, *structural zeros* arise, when an individual never engages into a certain activity due to individual characteristics. For example, unemployed declare zero minutes of time devoted to market work. Secondly, *sampling zeros* arise, if an individual does not spend time on a certain activity during the survey period (Brown and Dunn, 2011). (The latter is what possibly causes the large amounts of zeros and ones when operationalizing the dependent variable as a share – for more details see section 4.1.1).

The most popular methods for predicting total amounts of time are again OLS and Tobit models (see, for example, Baxter, 2002; Craig and Mullan, 2011; Deding and Lausten, 2006). However, given the characteristics of time use data, they do have some possible weaknesses. For activities which are not carried out regularly the OLS has shortcomings because it cannot account for a large share of exact zeros. Hence, its normality assumption could be violated due to the data's skewness (Brown and Dunn, 2011; Hammer, 2012). However, it might be appropriate for time categories such as

[3] A detailed illustration of the data's density distribution is provided in the appendix.

personal time, since they are exercised frequently by all subgroups. Furthermore, the linear model assumes that the effect of the explanatory variable is constant throughout the entire time (Ramalho and Ramalho, 2011). Yet, this does not have to be the case given the natural upper limit of 1440 minutes per day. Finally, due to its linearity, OLS could further fail to account for the data's non-negativity.

One drawback of the Tobit model could be that it assumes censoring (for more details see section 4.1.1.1). However, the absence of negative values in the analysis presented are based on the fact that values below zero are simply not feasible in time use data (Cardoso et al., 2010; Ramalho and Ramalho, 2011). The Tobit model further assumes that the data – at least theoretically – is normally distributed (Brown and Dunn, 2011). In other words, the values result from an underlying normally distributed latent variable. However, this is not the case with the data used in the analysis at hand.

An alternative model for predicting total amounts is the generalised poisson model (see, for example, Wooldridge, 2009, for a description). However, it is not suitable for the current case due to overdispersion, meaning that the data's variability is a lot larger than implied by the model (Gardner et al., 1995). This could be overcome with a negative binomial model instead (see, for example, Gardner et al., 1995; Hardin and Hilbe, 2007, for a description). It was applied to the current case, however, its fit was unsatisfactory. The same counts for the zero-inflated model (see, for example, Hardin and Hilbe, 2007, for a description), which was also applied to the current case. However, it did not provide an acceptable fit either.

Brown and Dunn (2011) as well as Hammer (2012) compared several estimation models for time use data when the dependent variable is operationsalized as a total amount. Building upon their insights, a Poisson-gamma model will be employed.

4.1.2.2 The Poisson-Gamma Model

To provide context for the results from the fractional logit model, total amounts of time are predicted as well, specifically, the total amount of time spent on a certain time category by the observed couple. Following the evaluation of

Brown and Dunn (2011) as well as Hammer (2012), a GLM with an underlying Poisson-gamma distribution is applied. With this method, the dependent variable is specified as the amount of time slots – each covers 15 minutes – spent by the observed household on either market work, housework, or childcare. The model is able to consider the time data's peculiarities discussed above. In particular, it is possible to account for the fact that the total amount of time a couple spends on a time category often consists of several episodes of different length or time slots conducted throughout the day (Hammer, 2012). For example, the total amount of time spent on childcare might consist of one spouse briefly preparing the child for school in the morning, and additionally the second spouse spends the whole afternoon with that child.

By splitting the data-generating process into two components, the Poisson-gamma model is able to differentiate between the amount of times a certain activity is conducted, and the length of that activity. Firstly, the amount of times an activity is carried out per day is expected to follow a Poisson distribution with mean $\lambda > 0$, determining N. The corresponding probability function can be written as follows (Brown and Dunn, 2011):

$$p(N = n; \lambda) = \frac{exp(-\lambda)\lambda^n}{n!} \tag{6}$$

N can also take on the value zero, thus the Poisson-component accounts for the many zeros in the data.

The duration of the time spent every time the activity is conducted is accounted for in the second component, the gamma distribution, which is denoted by Z_k, and has the following probability function:

$$f(Z = z; \alpha, \beta) = \frac{1}{\Gamma(\alpha)\gamma^\alpha} z^{\alpha-1} exp(-z/\gamma) \tag{7}$$

for $z > 0$, $\alpha > 0$ and $\gamma > 0$. The gamma distribution is a right-skewed distribution, hence accounting for the data's skewness to the right (Brown and Dunn, 2011). The total sum of time spent on a certain activity Y is then the result of the amount of times the activity was carried out N, and the length of time it was carried out Z. Hence:

$$Y = \sum_{k=1}^{N} Z_k \tag{8}$$

In other words, the total amount of time spent on an activity per day Y is assumed to follow a Poisson-gamma distribution. However, its probability function cannot be written in closed form directly (see Brown and Dunn, 2011; Dunn and Smyth, 2005; Hammer, 2012, for further discussion).

Given the special characteristics of time use data – the fact that it is able to account for a point mass at zero and flexibly adapts to the data's right-skewness – the Poisson-gamma distribution is the appropriate choice for when time use data is operationalized in absolute terms. Like mentioned above, the GLM with an underlying Poisson-gamma distribution can then be fitted with a maximum-likelihood algorithm.

4.2 Model Specification and Variables

After having discussed the applied estimation methods, this section will specify the model and will describe the variables of interest[4]. In the fractional logit model applied in the paper at hand, the vector of explanatory variables is specified as follows:

$$X_i = (X_f,\ X_m,\ H_j,\ Z_j) \tag{9}$$

where X_f and X_m respectively denote the individual characteristics of the man and the woman, namely education and age. H_j includes characteristics of household j, specifically the survey year and whether a couple lives in a city or not. If a couple has children, H_j also includes information about the number of children and their age. Z_j contains control variables. Hence, the estimation model is specified as:

$$E(s_f^c|X_i) = G(\beta_0 + \beta_1 X_f + \beta_2 X_m + \beta_3 H_j + \beta_4 Z_j) \tag{10}$$

Following the insights from section 2, the model will be estimated separately for couples with children and without children.

[4]Summary statistics of all variables used are provided in the appendix.

Education is a categorical variable, indicating whether an individual's highest educational attainment is (i) compulsory schooling (*Pflichtschule*) or less, (ii) an apprenticeship (*Lehrabschluss*) or similar (*Berufsbildende Mittelschule*), (iii) a high school degree (*AHS, BHS* or *Kolleg*) or (iv) a university degree (also includes applied universities like the so called *Fachhochschulen*). In the final estimation model, compulsory schooling serves as the base category. For robustness tests, other base categories were used, yet, they did not alter the results nor the models' fit. As discussed in section 2, it is expected that women's share in paid work increases, the higher educated she is and that her share in housework decreases, the higher educated she is. No clear predictions can be made regarding the relationship between childcare and education. Expectations about the effect of the man's education on the woman's specialisation are ambiguous too. *Age* is a cardinal variable, taking on values between 20 and 54, since the sample was restricted to this age group as described in section 3.1. An alternative specifications adding age-squared as an explanatory variable did not change the results nor the model's fit.

The dummy variable *year 2008/09* indicates in which year the TUS was conducted. It is 1 if the survey was conducted in 2008/09, and 0 if it was conducted in 1992. It is expected that the division of labour is more equal in 2008/09 than it was in 1992. Furthermore, the literature indicates that housework has decreased over time. *Living in a city* is also a binary variable, indicating whether a household is in a municipality with more than 100,000 inhabitants or not. Most of Austria is rather rural. In the sample observed, only 13,4 percent of the couples live in a city. It is expected that women in cities specialise less in unpaid work. Firstly, because outsourcing is easier. For example, there is better access to after school care for children or services such as take away food. Secondly, norms and expectations regarding a woman's role in the household might be less traditional in cities than on the countryside.

If a couple has children below the age of 19, two more variables are added to the model: Firstly, the *number of children* under the age of 19 living in the same household as their parents. As laied out in section 3.1, this threshold is chosen due to legal frameworks in 1992. Secondly, the *age of*

the youngest child is included, since it is expected that division of labour is the strongest when children are young.

Weekend is a binary control variable taking on the values from 0 or 1, therefore indicating whether the diary was filled in on a weekday or on the weekend. It is expected to be significant since activities differ distinctly between weekdays and weekends. For example, most people carry out paid work during the week. A second control variable is the total amount of time devoted to time category c in a household. Depending on the dependent variable in the particular model specification, this control variable is either operationalized as the household's total hours spent on market work, the total hours spent on housework, or the total hours spent on childcare.

Some variables are not included in the final estimation models. Initial model specifications, for example, controlled for the gender of the youngest child living in the household. The variable *Youngest is a Girl* was 1, if the youngest child was female and 0 otherwise. This variable was originally included because there is some evidence for an effect of the child's gender on the amount of childcare provided in a household (see, for example, Cabrera et al., 2000; Harris et al., 1998; Nettle, 2008). However, it did not yield significant results in the analysis at hand, nor did it alter the model's fit. Hence, it was excluded in the models presented. The same holds for a couple's marital status, which was observed with the variable *being married*. The binary variable was 1 in the case of a marriage, and 0 if a couple was unmarried. As discussed in section 2.1, marriage – as an institution – might change both genders' identity roles, hence influencing the allocation of paid and unpaid work. However, it did not yield significant results for the current sample.

Unfortunately, the Austrian TUS does not provide information regarding an observation's income and wealth. Furthermore, the data from 1992 does not allow to control for an individual's migration background appropriately. Using citizenship as a proxy for migration did neither change the model's fit nor provided significant results. Consequently, it is not included in the model. Also not included are control variables for both partners' employment status since this would be tautologous. Every individual can only spend 1440 minutes per day on activities. Consequently, employed naturally spend more time in market work and less time on other activities, than unoccupied indi-

viduals.

When predicting the total amount of time devoted to category c in a household, most of the explanatory variables are the same. The only difference is that the variable controlling for the household's total amount is comprehensibly not included as an independent variable.

Both models are estimated three times with three different response variables. Firstly labour is divided into paid and unpaid work. The latter is further separated into housework and childcare, since the analysis in section 2 revealed that their determinants might differ. *Personal time* and *leisure* are not observed, because section 3.2 revealed that those categories do not vary much with respect to gender and parenthood. Also, they are not directly associated with the division of labour. Hence, the three dependent variables of interest are *market work*, *housework*, and *childcare* – once specified in total amounts and once as a fraction.

4.3 Estimated Results and Interpretation

In this section, the results from the fractional logit model and the Poisson-gamma model will be presented. The dependent variables of interest were *market work*, *housework* and *childcare*. According to the estimation method conducted, they were either specified as the share of each partner in the observed category, or as the total amount devoted to the respective time category by the couple as a whole. To account for large heterogeneities between subgroups, the estimation was conducted separately for households with children and without children if the response variable was market work or housework. Taking all together, this section presents ten different model specifications.

Alternative specifications not presented in this section included the variable age-squared, a dummy indicating whether an individual was Austrian citizen or not, as well as different base categories for the categorical variable education. However, those alternatives did not yield significant results and further did not improve the models' fit. Also not included is the variable indicating whether a couple is married or not. Even though the marital status plays a crucial role in the literature (see section 2), it did not yield significant results

in the analysis at hand. The same holds for the youngest child's gender – it does not have a significant effect on the allocation of paid and unpaid work, nor on the total amounts spent within a household.

The base categories for the categorical variables are *compulsory or less* in the case of *education*, *1992* in the case of *year 2008/09* and *living in a rural area* in the case of *living in a city* and *during the week* in the case of *weekend*.

4.3.1 Determinants of Market Work

The results from the fractional logit model for women's share in market work are displayed in table 4. The coefficients are already converted so that they can be interpreted as the average effect of the explanatory variable on females' share in market work. Specifically, the coefficients are the average change in percentage points attributed to the regressor in question. For example, female academics with children have 13.7 percentage points higher share on average in market work than women with compulsory education or less, all other factors held constant. Given that the average share in paid work of mothers with compulsory education or less is 33.5 percent, it would result in a 47.2 percent share for academics, if all other things were equal (which they are not; hence the empirical average in paid work for women with tertiary education is 42.7 percent as displayed in table 1). Since the spouses' shares mirror each other and add up to 1 receptively 100 percent, the table can also be interpreted with respect to men's share in market work. If a man's partner's highest educational attainment is a university degree, his share in paid work decreases on average by 13.7 percentage points, ceteris paribus.

The output confirms that education is a good predictor for the allocation of market work within households, at least for couples with children. The higher educated mothers are, the larger their fraction of paid work. If mothers' highest educational attainment is an apprenticeship or similar, their share is on average 4.9 percentage points larger than that of mothers with compulsory education or less. A high school degree further increases the share. It is then by 8.0 percentage points larger than the base category. Hence, the results provide evidence that mothers' education is positively correlated

Table 4: Determinants of Women's Share in Market Work

	Children		Childless	
Apprenticeship Woman	0.049***	(0.014)	0.022	(0.023)
High School Woman	0.080**	(0.025)	0.029	(0.034)
Tertiary Woman	0.137***	(0.024)	0.028	(0.047)
Age Woman	0.000	(0.002)	-0.006**	(0.002)
Apprenticeship Man	-0.074***	(0.017)	-0.075*	(0.031)
High School Man	-0.127***	(0.024)	-0.049	(0.039)
Tertiary Man	-0.112***	(0.027)	-0.080	(0.048)
Age Man	-0.001	(0.002)	0.003	(0.002)
Year 2008/09	0.066***	(0.015)	0.019	(0.023)
Living in a City	0.015	(0.013)	-0.008	(0.019)
Weekend	0.138***	(0.024)	0.055	(0.040)
Hours Market Work	0.014***	(0.001)	0.012***	(0.002)
Number of Children	-0.024**	(0.008)		
Age Youngest Child	0.010***	(0.002)		
Observations	2301		1078	

Fractional logit estimates; dependent variable: women's share in market work; marginal effects (dy/dx) reported at means; standard errors in parentheses; *p<0.1, **p<0.05, ***p<0.01; summary statistics are provided in the appendix

with their share in paid work. Fathers' education on the other hand is negatively correlated with mothers' fraction in paid work. The effect is the largest for men with a high school degree, namely minus 12.7 percentage points compared to if a man only has compulsory education or less. For childless households, the estimation does not provide any significant results for female education. The only education-variable relevant seems to be whether a man's highest educational attainment is apprenticeship or not. However, this result can not be interpreted meaningfully on its own. Women's age only seems relevant, if they are childless and men's age is not significant in both samples.

Like expected, the dummy variable *year 2008/09* has an effect on the division of labour. On average, mothers' share in market work was by 6.6 percentage points higher in 2008/09 than in 1992, c.p. , indicating a slight convergence. However, the variable does not provide statistically significant results for childless couples. Contrary to expectations, *living in a city* has no significant effect on the division of labour within households. Conversely, both control variables – *weekday* and *hours market work* – are highly significant. They indicate that market work is more equally distributed on week-

ends and the more hours a couple spends on market work in total.

The more children a couple has, the lower the woman's share in market work, respectively the larger the man's share in market work, c.p.. Each child increases specialisation by 2.4 percentage points on average. Furthermore, the younger the child, the larger is the segregation. Women's share in market work is negatively correlated with the age of her youngest child and increases by 1 percentage point for each additional year.

Table 5 provides additional insights into market work on a household level by displaying the results from the Poisson-gamma model. The dependent variable was the amount of time slots – each contains 15 minutes – contributed to housework by a couple. In this model, the coefficients describe the multiplicative influence of the explanatory variables. Hence, the natural exponential function has to be applied before interpreting them. For example, in order to interpret the coefficient of *tertiary woman* in households with children, one has to calculate $e^{0.153} = 1.17$. Thus, if the woman's highest educational attainment is a university degree, the household's total time devoted to market work is on average 1.17 times the amount in households where the woman only has compulsory education or less.

Besides *tertiary women*, *apprenticeship woman* and *apprenticeship man* have a significant effect on the total amount of market work in households with children. Furthermore, more time is devoted to paid work in households in 2008/09 than in 1992. This is true for couples with children and without children. The effect is $e^{0.128} = 1.14$, respectively $e^{0.158} = 1.17$. Also, the older the youngest child grows, the more time a household devotes to market work.

The determinants of market work in households with childless couples have similar significance and the same signs. However, the effects' sizes are somewhat different. The total amount of a households' paid work in households where women's highest educational attainment is an apprenticeship or similar, is, on average, $e^{0.162} = 1.18$ times the amount of the base category. If she has a university degree it is even $e^{0.236} = 1.27$ times the amount of the base category. Furthermore, the amount of paid work in a household

Table 5: Determinants of Households' Total Market Work

	Children		Childless	
Apprenticeship Woman	0.052*	(0.029)	0.162***	(0.043)
High School Woman	0.079*	(0.047)	0.076	(0.067)
Tertiary Woman	0.153***	(0.054)	0.236**	(0.093)
Age Woman	-0.004	(0.003)	0.003	(0.004)
Apprenticeship Man	-0.064*	(0.034)	-0.058	(0.056)
High School Man	-0.080	(0.050)	-0.089	(0.075)
Tertiary Man	-0.077	(0.057)	-0.137	(0.091)
Age Man	-0.001	(0.003)	-0.013***	(0.004)
Year 2008/09	0.128***	(0.029)	0.158***	(0.044)
Living in a City	-0.010	(0.029)	0.019	(0.038)
Weekend	-1.349***	(0.044)	-1.258***	(0.064)
Number of Children	-0.010	(0.017)		
Age Youngest Child	0.018***	(0.003)		
Constant	3.843***	(0.095)	4.337***	(0.105)
Observations	2,760		1,319	

Poisson-gamma estimates; summary statistics are provided in the appendix; dependent variable: time slots devoted to market work by couple; standard errors in parentheses; *p<0.1, **p<0.05, ***p<0.01;

decreases with the age of the man. For the Poisson-gamma model, only one control variable is used, namely *weekend*, which is highly significant for both subsamples. Understandably, households spend more time on paid work during the week.

The results confirm education as a major predictor for women's participation in the labour market. The higher a woman's education, the larger is her share in market work. Moreover, the total amount of market work increases with her education. These findings support predictions from all three streams of theory introduced in section 2.1. The fact that men's education has a negative effect on the division of market work within households supports human capital theory. It further denies social capital theory, due to the negative correlation of men's resources and women's participation in the labour market.

Children are also an important determinant of market work in households, they seem to amplify labour segregation. The more children a couple has and the younger they are, the lower are women's relative participation in the labour market. Furthermore, the overall time devoted to market work

increases, the older children grow. Hence, it could be that women's share only increases due to their increase of market work and not due to men's decrease. There is further convincing evidence for a convergence of market work within households from 1992 to 2008/09. However, the gap in paid work within couples is still large.

4.3.2 Determinants of Housework

This analysis now turns to the allocation of housework within couples. When comparing table 4 to table 6 one can see that again, women's education is a major determinant of the share in housework in households with children. However, this time, the coefficients' signs are negative. If a woman's highest educational attainment is an apprenticeship or similar, her share in housework is on average and all other factors held constant 2.9 percentage points lower than that of women with compulsory education or less. The difference increases to 4.6 percentage points if she has a high school degree and 6.8 percentage points, if she has a university degree. For the allocation of housework, men's education seems irrelevant. Only if fathers have a high school degree, they seem to contribute significantly more.

Table 6: Determinants of Women's Share in Housework

	Children		Childless	
Apprenticeship Woman	-0.029**	(0.010)	-0.024	(0.017)
High School Woman	-0.046**	(0.016)	-0.042	(0.026)
Tertiary Woman	-0.068***	(0.017)	-0.069	(0.036)
Age Woman	-0.001	(0.001)	0.003	(0.002)
Apprenticeship Man	0.021	(0.012)	-0.004	(0.022)
High School Man	0.038*	(0.017)	-0.020	(0.029)
Tertiary Man	0.019	(0.019)	-0.062	(0.035)
Age Man	0.002	(0.001)	0.000	(0.002)
Year 2008/09	-0.082***	(0.010)	-0.097***	(0.017)
Living in a City	-0.003	(0.010)	-0.033*	(0.015)
Weekend	-0.087***	(0.008)	-0.039*	(0.016)
Hours Housework	-0.013***	(0.001)	-0.013***	(0.002)
Number of Children	0.021***	(0.006)		
Age Youngest Child	-0.001	(0.001)		
Observations	2752		1304	

Fractional logit estimates; dependent variable: women's share in housework; marginal effects (dy/dx) reported at means; standard errors in parentheses; *p<0.1, **p<0.05, ***p<0.01; summary statistics are provided in the appendix

The variable *year 2008/09* is, again, significant this time for both subsamples. On average, women's share in housework has decreased by 8.2 percentage points from 1992 to 2008/09 in households with children and by 9.7 percentage points in households without children, c.p.. Hence, a slight convergence of tasks happened in both subgroups. *Living in a city* only seems to be relevant for childless couples. The allocation of housework is more unequal in rural areas, namely by 3.3 percentage points. Furthermore, both control variables have significant coefficients again. Housework is more equally distributed within couples during the week. Furthermore, women's share is negatively correlated with the total amount of hours spent on housework.

Furthermore, each child increases women's share in housework by 2.1 percentage points on average, hence decreasing men's contribution. The variable *age youngest child* has no statistically significant effect.

When analysing the total amount of housework with the Poisson-gamma model, one can see that it is heavily dependent on women's education as well. The results are presented in table 7. The higher her educational attainment, the lower the overall time devoted to household tasks by a household. This is true for both subsamples. For example, if a woman with children has a high school degree, housework is on average $e^{-0.115} = 0.89$ times lower than in households where the woman only has compulsory education or less. It is further $e^{-0.209} = 0.81$ times lower, if she has a university degree, c.p.. Interestingly, men's educational attainment has no overall effect on a couple's time devoted to housework although it increases with his age in childless households.

The results further reveal a significant decrease of housework from 1992 to 2008/09. Households with children reduced their time devoted to household tasks by $e^{-0.069} = 0.93$ times compared to 1992 and childless couples even by $e^{-0.115} = 0.89$ times, c.p.. Furthermore, couples spend less time on household tasks, if they live in cities. The *number of children* understandably also increases the time a couple devotes to housework since it connotes a larger household size and the results further indicate that more housework is done on weekends.

Table 7: Determinants of Households' Total Housework

	Children		Childless	
Apprenticeship Woman	-0.056**	(0.023)	-0.136***	(0.041)
High School Woman	-0.115***	(0.038)	-0.193***	(0.069)
Tertiary Woman	-0.209***	(0.046)	-0.125	(0.101)
Age Woman	0.012***	(0.003)	0.002	(0.004)
Apprenticeship Man	0.033	(0.027)	0.107**	(0.053)
High School Man	-0.018	(0.041)	0.017	(0.075)
Tertiary Man	-0.033	(0.047)	0.031	(0.094)
Age Man	0.002	(0.003)	0.015***	(0.004)
Year 2008/09	-0.069***	(0.024)	-0.115**	(0.047)
Living in a City	-0.063***	(0.023)	-0.122***	(0.038)
Weekend	0.021	(0.024)	0.121***	(0.043)
Number of Children	0.071***	(0.014)		
Age Youngest Child	0.001	(0.003)		
Constant	2.676***	(0.077)	2.390***	(0.113)
Observations	2,760		1,319	

Poisson-gamma estimates; summary statistics are provided in the appendix; dependent variable: time slots devoted to housework by couple; standard errors in parentheses; *p<0.1, **p<0.05, ***p<0.01;

The evidence provided by the fractional logit model and the Poisson-gamma model are very much in line with the literature. There was a significant reduction in housework over time, indicating that couples either started outsourcing tasks, are more likely supported by time-efficient machinery such as dish-washers, or simply care less about wrinkly shirts and overgrown frontyards. This interpretation is supported by the fact that couples in urban areas spend less time on housework, since there (i) it is easier to outsource tasks and (ii) it is assumed that norms are less traditional, hence unironed shirts are more readily accepted than in rural areas.

Additionally to the reduction of total housework in households, women's relative contribution to housework has decreased from 1992 to 2008/09. This finding is also in line with the literature and indicates that the division of labour with respect to housework got more equal because of women doing less, not because of men doing more housework. This interpretation is further supported by the results presented in the descriptive analysis in section 3.2. The same could be true for the effect of education on the allocation of housework. High educational attainment of both partners could lead to

women doing less housework, hence resulting in less specialisation within households. Regardless of what the exact channels are, education is once again confirmed as a major determinant of the division of labour.

4.3.3 Determinants of Childcare

The results for childcare differ from those of market work and housework, hence approving the approach of observing it separately. As visible in table 8, women's education has no effect on the allocation of tasks. Instead, men's education is the major determinant. The better educated the men are, the higher are women's shares in childcare. If a man's highest educational attainment is apprenticeship or similar, on average, his share is 6.2 percentage points lower than that of a man with compulsory education or less, c.p.. The same difference occurs if he has a high school degree and rises to 7.4 percentage points if he has a university degree.

Table 8: Determinants of Women's Share in Childcare

		Children
Apprenticeship Woman	-0.000	(0.017)
High School Woman	-0.033	(0.024)
Tertiary Woman	-0.029	(0.027)
Age Woman	-0.001	(0.002)
Apprenticeship Man	0.062**	(0.021)
High School Man	0.062*	(0.028)
Tertiary Man	0.074*	(0.029)
Age Man	0.001	(0.002)
Year 2008/09	-0.075***	(0.016)
Living in a City	-0.033*	(0.016)
Weekend	-0.149***	(0.016)
Hours Childcare	-0.013***	(0.003)
Number of Children	0.028**	(0.009)
Age Youngest Child	-0.003	(0.002)
Observations	1871	

Fractional logit estimates; dependent variable: women's share in childcare; marginal effects (dy/dx) reported at means; standard errors in parentheses; *p<0.1, **p<0.05, ***p<0.01; summary statistics are provided in the appendix

Like with the other tasks, a slight convergence occurred also in childcare since 1992. In 2008/09, women's share in childcare was 7.5 percentage points lower, hence higher for men, than in the older survey. Furthermore,

Table 9: Determinants of Households' Total Childcare

Apprenticeship Woman	0.065	(0.049)
High School Woman	0.076	(0.071)
Tertiary Woman	0.138*	(0.082)
Age Woman	-0.013**	(0.006)
Apprenticeship Man	0.084	(0.061)
High School Man	0.149*	(0.081)
Tertiary Man	0.303***	(0.087)
Age Man	-0.007	(0.005)
Year 2008/09	0.244***	(0.044)
Living in a City	0.063	(0.046)
Weekend	-0.107**	(0.049)
Number of Children	0.186***	(0.027)
Age Youngest Child	-0.148***	(0.005)
Constant	3.171***	(0.145)
Observations	2,760	

Poisson-gamma estimates; summary statistics are provided in the appendix;
dependent variable: time slots devoted to childcare by couple;
standard errors in parentheses; *p<0.1, **p<0.05, ***p<0.01;

the allocation of childcare is more balanced in cities than in rural areas, namely by 3.3 percentage points. Once again, both control variables are significant. Childcare is rather equally distributed between couples on weekends, and if childcare is high in total amounts. With respect to children, only the *number of children* seem to be relevant for the division of childcare. The more children a couple has, the less balanced is the allocation of child related tasks. The age of the youngest child seems irrelevant for the allocation.

Table 9 provides results from the Poisson-gamma model, hence the determinants of the total amount of childcare provided in a household. The total amount of time devoted to child related tasks is significantly larger if both, woman and man, have high educational attainment. A woman's university degree increase childcare on average by $e^{0.138} = 1.15$ times compared to women with compulsory education or less, c.p.. A man's high school degree increases childcare by $e^{0.149} = 1.16$ times and a university degree even by $e^{0.303} = 1.35$ times compared to the base category, c.p..

Furthermore, there was a large increase in childcare from 1992 to 2008/09. All other things held constant, it increased by $e^{0.244} = 1.27$ times. Under-

standably, the *number of children* increases the time devoted to childcare. Furthermore, children need more time when they are younger, hence time devoted to childcare increases when they grow older.

The effect of men's education supports all three streams of theory presented in section 2, namely human capital theory, bargaining models, and models related to norms and institutions. When following bargaining models, it further indicates that men bargain out of childcare rather than into it. Hence, they might perceive it as something unpleasant. However, the reduction in the division of childcare together with the overall increase in childcare shows that men do contribute more now than they did in 1992. This indicates a change in norms and a slight relaxation of traditional gender roles.

4.4 Model Evaluation

After having presented and interpreted the results of the econometric analysis, this section provides an evaluation of both models' fit. By comparing the observed values conducted during the time use survey to the predicted values, each model's strengths and weaknesses will be visualised.

The process underlying the generation of time use data is a complex one and different for every subsample and activity. The biggest challenge when fitting the estimation models is accounting for the data's many sampling zeros. They arise due to the fact that not every activity is carried out every single day. Although it is unlikely that those activities are never carried out by an individual – like housework for example. The large amount of zeros results in an increased right-skewness of the data in the case of the dependent variable being time, and in spikes at the extreme values – zero and one – in the case of the dependent variable being a share.

4.4.1 Evaluating the Fractional Logit Model

In order to evaluate the fractional logit model, the observed data will be compared to the predicted values from the model. Figure 3 exemplifies the visualisation of the model evaluation for the case of childcare. Overall, the evaluation reveals that the fractional logit model does not fully account for the point mass at zero and one. In the case of women's empirically observed share in childcare (figure 3), the spike is above one or 100 percent. Yet, the

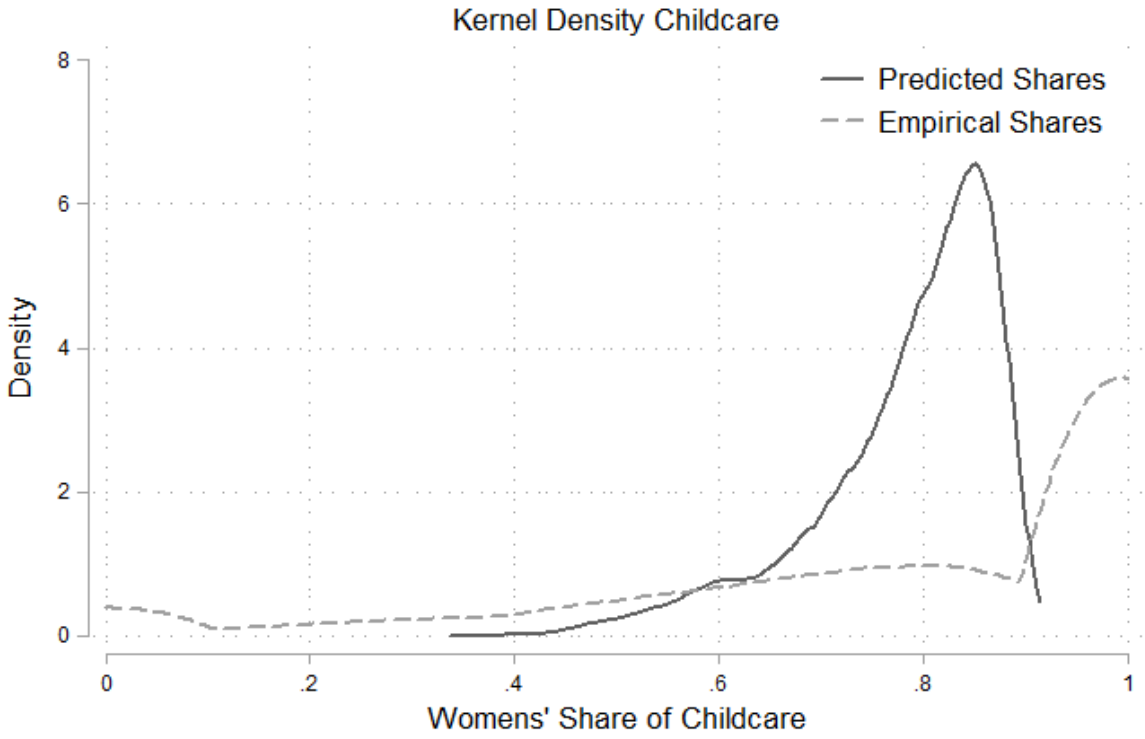

Figure 3: Empirical and Predicted Density of Women's Share of Childcare

majority of the predicted values are above 0.8 or 80 percent.

Given that the fractional logit model is assumed to predict the overall allocation of labour within households, the underestimation of the point mass at zero and one does not make its application less appropriate. The spikes at the extreme values are mainly due to sampling zeros which occur due to the fact that the time-diary is only to be filled out on one single day. However, it is very unlikely that an individual never engages in a certain time category. Especially, with housework and childcare, there is a chance that there are days where the probands spent no time on those time categories. However, it is hard to imagine that they would never engage in them.

4.4.2 Evaluating the Poisson-Gamma Model

In order to evaluate the Poisson-gamma model applied, the observed data will be compared with the fitted Poisson-gamma density. The distribution is based on the following parameters: the response variable's $mean$, the dis-

persion parameter taken to fit the model, phi, and the parameter p, which is estimated in a first step of the model estimation, so that the variance is of the form $\phi\mu^p$. This time, two examples of very different distributions are chosen to visualise the model's flexibility. Figures 4 and 5 compare the predicted values to the observed values.

Overall, the Poisson-gamma model provides a good fit for the observed data. For the total amount of childcare (figure 5), one can see very clearly how the Poisson-part of the model allows to account for the large amount of zeros. However, the model does not perfectly account for the patterns in market work. The model captures the point mass at zero for both subsamples very well. However, the data for market work has further spikes[5], which most likely occur because of the legal framework concerning working hours. Due to the fact that most employment contracts in Austria set working hours at either 40 or 32 hours a week, time devoted to market work does not follow

[5]A detailed illustration of the data's density distribution is provided in the appendix.

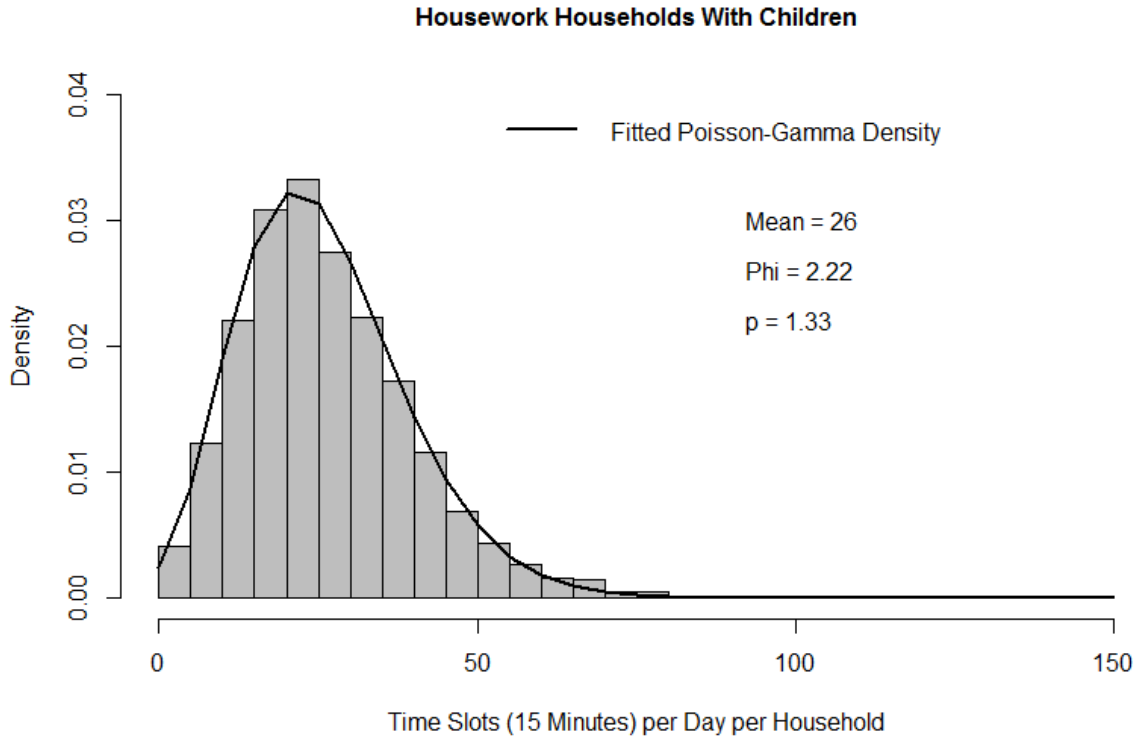

Figure 4: Empirical and Predicted Density of Household's Time Devoted to Housework (Children)

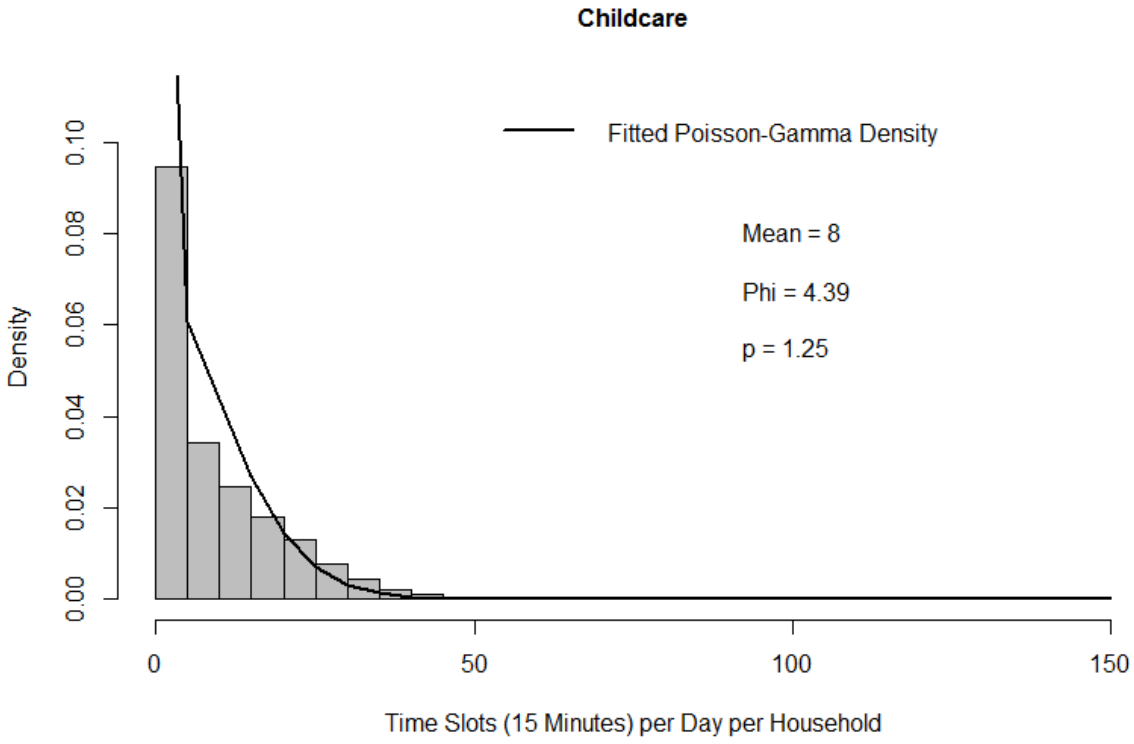

Figure 5: Empirical and Predicted Density of Childcare Devoted to Housework

a smooth distribution.

The complex factors underlying the data generating process make fitting a model challenging. Particularly, because the distributions differ between subsamples and time categories especially. However, both, the fractional logit model and even more the Poisson-gamma model provide a satisfactory approximation. Conducting the time use survey on more than one day – like it is done in Germany – would decrease the amount of sampling zeros and allow for a more precise illustration of time use patterns.

5 Conclusion

This paper has shown that gender, along with education and parenthood, is the most important determinant of the division of labour within households. The analysis combines standard absolute measures of time use with the relative measure of the share of market work, housework, and childcare. Hereby, the within-household dynamics can be studied with more diversity

because the approach accounts for the complex interdependencies of the household members' individual characteristics. Those dynamics were studied in Austria for the first time. The results agree with the current literature and predictions based on theory, which strongly confirms the approach as a substantial source of insight for observing the determinants. A Poisson-gamma model was applied to the Austrian time use survey of 1992 and 2008/09, which revealed that market work and childcare have increased over time, while housework has decreased. Moreover, the fractional logit model allowed for the determinants' interdependencies to be observed in more detail, revealing a slight convergence of paid and unpaid work in the last two decades.

This analysis began by presenting three common streams of theory that explain the division of labour, each of which focuses mainly on either relative resources, power relations, or gender roles. Human capital theory predicts that the spouses' individual resources, such as human capital and income, define the allocation of labour. Bargaining models take on a similar approach, however, they also consider power relation and inequalities to be important determinants. Theories based on norms and institutions go one step further by acknowledging that the way in which couples share paid and unpaid work results from the psychological and sociological aspects of identity, in other words gender roles.

Each of the three theoretical approaches is eligible for explaining parts of the dynamics described in the empirical literature review. Overall, women do the lion's share of unpaid work even in egalitarian countries. However, cultural norms and national institutions do have an influence on the magnitude of the specialisation, thereby giving credits to theories with sociological viewpoints. Most observed countries show signs of convergence over time between paid and unpaid work. This convergence is mainly due to the reduction of time that women devote to unpaid work, respectively the increase of their time devoted to paid work. This is particularly true for highly educated women, thereby referring to the human capital and bargaining power perspective.

The determinants outlined in the empirical analysis of this paper also apply to the three streams of theory that were presented. For example, resource

related theories help explain education as a major determinant of the allocation of time within Austrian households. Overall, it appears that the more educated an individual is, the larger their share in paid work. Additionally, women's education is negatively correlated with their own share in housework and men's education is negatively correlated with their own share in childcare. This result supports the human capital theory and bargaining models because they show the tendency that the larger an individual's resource, the less likely they are to perform unpaid tasks. The results further negate social capital theory. No evidence was found for an individual's education having a positive correlation with their spouses share in market work. The negative effect of men's education on their partner's share in market work further indicates that even though educated individuals might have a more positive attitude towards gender equity, this does not necessarily translate to their behaviour.

Additional aspects appear when differentiating between households with and without children. On average, childless women with only compulsory education (or less) have a larger share in paid work than female academics with children. It seems that motherhood diminishes the effect of education on women's relative participation in the labour market. Assuming, that parenthood introduces strong role models, this aspect approves theories based on norms and institutions. However, and contrary to parenthood, marriage as an institution appears to have no effect on the division of labour.

In agreement with the literature, housework in Austria has decreased over the last two decades. Furthermore, housework within households has been more equally allocated, indicating that women have reduced their time devoted to those tasks. This is particularly true for well-educated females, giving credit to resource related theories. However, analogously with paid work, female specialisation into housework increases once they become mothers, indicating a manifestation of gender roles. The overall reduction of housework could be due to several reasons. Firstly, gains in productivity might have contributed. For example, modern cooking appliances, such as microwave ovens, make cooking a less time-consuming task. Secondly, households might rely more on outsourcing, such as consuming take-away meals. Lastly, the work might simply be left undone. An example might be that people care less about un-ironed shirts and overgrown front yards

than 20 years ago, due to a change in norms and aspirations. The last two of these reasons are strongly supported by the observation that couples in urban areas spend even less time on housework, because it is easier to outsource tasks there, and it is assumed that norms are less traditional than in rural areas.

The many aspects of the allocation of childcare within households can also be explained by the theoretical instruments provided in this paper. Childcare has increased since 1992 in absolute terms and is now more equally distributed, especially in cities. However, women still specialise into childcare more than men, notably when their children are young and their partners are well-educated. Additionally, the education level of men is negatively correlated with their own share in childcare. When analysing this tendency with the bargaining model, the results indicate that men bargain out of childcare rather than into it. The strong specialisation of women – independent from their educational attainment – further supports theories based on norms and institutions. The most remarkable result regarding childcare is the extensive positive effect of a university degree on the total amount of childcare. There are three possible explanations for this effect. First, educated parents might be particularly concerned with their offspring's acquisition of human capital and subsequently spend more time with them. Second, well-educated parents are likely to have higher income and wealth, allowing them to spend time with their children rather than on market work. Third, and in contrast, well-educated parents may spend more time in market work and consequently feel obligated to devote even more time to their children once they are at home.

The conclusions drawn in this paper are not without limitations and this opens avenues for further research. One direction of future work is to consider the income and wealth of households or individuals, which is not provided by the Austrian TUS. This would enable a direct examination of resource related theories. The strong effect of education on the division of labour might be partly due to the correlation of education and income or wealth. Furthermore, outsourcing and the trade of paid work for time with children is easier for high-income or wealthy households. Information on income and wealth would further allow a detailed study of the chicken-and-egg-problem of whether unequal earnings for men and women at the market

foster women's specialisation into unpaid work, or contrastingly, if women's specialisation into unpaid work decreases their wages. Another direction of future work is to appropriately control for the migrational background of individuals. Information on that would be particularly interesting given that people with migrational background are likely unrepresented in the Austrian TUS. It would also be interesting to consider a multi-day time use survey because this could reduce the amount of sampling zeros in the data, allowing a more precise estimate of actual time patterns. Finally, future studies could consider secondary activities as well as a more detailed differentiation of unpaid tasks. The latter could be particularly useful to better understand the complexity of childcare. If childcare were to be separated into routine and non-routine activities, one could account for differences in pleasant and unpleasant tasks.

In conclusion, this paper has provided profound insights into the division of labour within households. Its empirical analysis has shown an increase in market work and childcare, but a decrease in overall housework in the last two decades. The analysis further provided instruments to comprehensively analyse the dynamics of this development by providing theoretical background and by studying time use patterns in relative terms. The latter revealed a slight relaxation of gender roles, varying with respect to education and parenthood, however, despite the relaxation, the segregation of paid and unpaid work still persists.

6 Bibliography

Baum, C. (2008). Modeling proportions. *Stata Journal*, 8(2):299–303.

Baxter, J. (2002). Patterns of change and stability in the gender division of household labour in Australia, 1986-1997. *Journal of Sociology*, 38(4):399–424.

Baxter, J., Hewitt, B., and Western, M. (2005). Post-Familial Families and the Domestic Division of Labour . *Journal of Comparative Family Studies*, 36(4):583–600.

Becker, G. S. (1976). *The Economic Approach to Human Behavior*. University of Chicago Press, Chicago.

Becker, G. S. (1985). Human Capital, Effort, and the Sexual Division of Labor. *Journal of Labor Economics*, 3(1):33–58.

Becker, G. S. (1991). *A treatise on the family*. Harvard University Press, Cambridge, first edition.

Bianchi, S. M., Milkie, M. A., Sayer, L. C., and Robinson, J. P. (2000). Is Anyone Doing the Housework? Trends in Gender Division of Household Labor. *Social Forches*, 79(1):191–228.

Bittman, M., England, P., Sayer, L., Folbre, N., and Matheson, G. (2003). When Does Gender Trump Money? Bargaining and Time in Household Work. *The American Journal of Sociology*, 109(1):186–214.

Bittman, M. and Pixley, J. (1997). *The Double Life of the Family: Studies in Society Series*. Allen and Unwin, Syndey.

Brooks, C. and Bolzendahl, C. (2004). The transformation of US gender role attitudes: cohort replacement, social-strctural change, and ideological learning. *Social Science Research*, 33:106–133.

Brown, J. E. and Dunn, P. K. (2011). Comparison of Tobit, Linear, and Poisson-Gamma Regression Models: An Application of Time Use Data. *Sociological Methods and Research*, 40(3):511–535.

Cabrera, N. J., Tamis-LeMonda, C. S., Bradley, R. H., Hofferth, S., and Lamb, M. E. (2000). Fatherhood in the twenty-first century. *Child Development*, 71:127–136.

Cardoso, A. R., Fontainha, E., and Monfardini, C. (2010). Children's and parents' time use: empirical evidence on investment in human capital in France, Germany and Italy. *Review of Economics of the Household*, 8:479–504.

Craig, L. (2006a). Does Father Care Means Fathers Share?: A Comparison of How Mothers and Fathers in Intact Families Spend Time with Children. *Gender Society*, 259(20):259–281.

Craig, L. (2006b). Parental education, time in paid work and time with children: an Australian time-diary analysis. *The British Journal of Sociology*, 57(4):553–575.

Craig, L. and Mullan, K. (2011). How Mothers and Fathers Share Childcare: A Cross-National Time-Use Comparison. *American Sociological Review*, 76(6):834–861.

De Laat, J. and Sevilla-Sanz, A. (2011). The Feritlity and Women's Labor Force Participation puzzle in OECD Countries: The Role of Men's Home Production. *Feminist Economics*, 17(2):87–119.

Deding, M. and Lausten, M. (2006). Choosing between His Time and Her Time: Paid and Unpaid Work of Danish Couples. *electronic International Journal of Time Use Research*, 3:28–48.

Dunn, P. K. and Smyth, G. K. (2005). Series evaluation of Tweedie exponential dispersion model densities. *Statistics and Computing*, 15:267–280.

Gardner, W., Mulvey, E. P., and Shaw, E. C. (1995). Regression analyses of counts and rates: Poisson, overdispersed Poisson, and negative binomial models. *Psychological Bulletin*, 118(3):392–404.

Greenwood, J., Gunder, N., Kocharkov, G., and Santos, C. (2014). Marry Your Like: Assortative Mating and Income Inequality. *American Economic Review*, 105(5):348–353.

Haberkern, K. (2007). Zeitverwendung und Arbeitsteilung in Paarhaushalten. *Zeitschrift für Familienforschung*, 19(2).

Hammer, B. (2012). Statistical models for time use data: An application to housework and childcare activities using the austrian time use surveys from 2008 and 1992. Master's thesis, Universtität Wien.

Hardin, J. W. and Hilbe, J. M. (2007). *Generalized Linear Models and Extenstions*. Stata Press, College Station, second edition.

Harris, K. M., Furstenberg, F. F., and Marmer, J. K. (1998). Paternal involvment with adolescents in intact families: The influence of fathers over the live course. *Demography*, 35:201–216.

Kitterød, R. H. and Lappegård, T. (2010). A typology of work-family arrangements among dual-earner couples in norway. Technical Report 636, Statistics Norway.

Klaus, D. and Steinbach, A. (2002). Determinanten innerfamilialer Arbeitsteilung: Eine Betrachtung im Längsschnitt. *Zeitschrif für Familienforschung*, 14(1):21–43.

Lachance-Grzela, M. and Geneviève, B. (2010). Why Do Women Do the Lion's Share of Housework? A Decade of Research. *Sex Roles*, 63:767–780.

McCullagh, P. and Nelder, J. A. (1989). *Generalized Linear Models*. Chapman and Hall, London, second edition.

Mullahy, J. (2010). Multivariate Fractional Regression Estimation of Econometric Share Models. Technical report, National Bureau of Economic Research. Working Paper Series Number 16354.

Nettle, D. (2008). Why do some dads get more involved than others? Evidence from a large British cohort. *Evolution and Human Behavior*, 29(6):416–423.

OECD (2011). Employment rates by age group. In: OECD Factbook 2011-2012: Economic, Environmental and Social Statistics. Technical report. OECD Publishing.

Papke, L. E. and Wooldridge, J. M. (1996). Econometric Methods for Fractional Response Variables with an Application to 401(K) Plan Participation Rates. *Journal of Applied Econometrics*, 11:619–632.

Pasteels, J. (2012). ILO Projections of the Economically Active Population: Revised Methodology of the 2011 Edition. Technical report, ILO.

Petreski, M. and Blazevski Mojsoska, N. (2015). The gender and motherhood wage gap in the former Yugoslav Republic of Macedonia: An econometric analysis. Technical report, ILO. Working Paper No.6/2015.

Ramalho, E. A. and Ramalho, J. J. (2011). Alternative Estimating and Testing Empirical Strategies for Fractional Regression Models. *Journal of Economic Surveys*, 25(1):19–68.

Ravanera, Z. and Beaujot, R. (2009). Models of Earning and Caring: Determinants of the Division of Work. *Canadian Review of Sociology*, 46(4):319–337.

Sayer, L., Casper, L., and Cohen, P. (2004). *In: The American People: Census 2000*, chapter Women, Men, and Work. Editors: Farley, R., and Haaga, J., pages 76–106. Russell Sage Foundation, New York.

Sevilla-Sanz, A., Gimenez-Nadal, J. I., and Fernándes, C. (2010). Gender Roles and the Division of Unpaid Work in Spanish Households. *Feminist Economics*, 16(4):137–184.

Statistik Austria (1992a). Allgemeine Hinweise (Documentation Time Use Survey 1992). Technical report.

Statistik Austria (1992b). Tagebuch Muster (Documentation Time Use Survey 1992). Technical report.

Statistik Austria (2009). Zeitverwendung 2008/2009: Ein Überblick über geschlechtsspezifische Unterschiede. Endbericht der Bundesanstalt Statistik Österreich an die Bundesministerin für Frauen und Öffentlichen Dienst. Technical report.

Statistik Austria (2011). Standard-Dokumentationen Metainformation (Definitionen, Erläuterungen, Methoden, Qualität) zur Zeitverwendungserhebung 2008/09 (Documentation Time Use Survey). Technical report.

Statistik Austria (2015). Microcensus - Arbeitskräfteerhebung. http://www.statistik.at/web_de/statistiken/menschen_und_gesellschaft/soziales/gender-statistik/erwerbstaetigkeit/index.html. Accessed: 09/06/16.

Statistik Austria (2016). Erwerbsstatus. http://www.statistik.at/web_de/statistiken/menschen_und_gesellschaft/arbeitsmarkt/erwerbsstatus/index.html. Accessed: 11/07/16.

Universität Innsbruck (2016). Online Lehrbuch Zivilrecht: Die natürliche Person. https://www.uibk.ac.at/zivilrecht/buch/kap4_0.xml?section=1;section-view=true. Accessed: 06/06/16.

Wooldridge, J. M. (2009). *Introductory Econometrics: A Modern Approach*. South-Western CENGAGE Learning, Toronto, fourth edition.

A Appendix

Table A-10: Overview Time Categories 2008/09*

English Translation	German (Original)
Personal Time	
sleeping/ pauses	Schlafen/Pausen
eating/ drinking	Essen/Trinken
personal hygiene	Körperpflege
personal medical care and wellness at home	Persönliche medizinische Versorgung und Wellness zu Hause
personal activity w.c.a	Persönliche Tätigkeiten o.n.A
personal travel time	Persönliche Wegzeiten
Leisure	
social contacts	Soziale Kontakte
voluntary work, honorary and club activities	Freiwilligenarbeit, ehrenamtliche Tätigkeit, Vereinstätigkeit
travel time voluntary work	Wege - Freiwilligenarbeit
culture and entertainment	Kultur und Unterhaltung
exercise and sport	Bewegung und Sport
hobbies, crafting, games	Hobbys, basteln, Spiele
usage of media	Mediennutzung
travel time other leisure activities	Wege - sonstige Freizeitaktivitäten
Housework	
cooking, kitchen	Kochen, Küche
cleaning the apartment or house	Reinigung von Wohnung oder Haus
cleaning and maintenance of laundry/clothes	Reinigung und Instandhaltung von Wäsche/Kleidung
gardening and pet care	Garten- und Haustierversorgung
handcraft and maintenance of vehicles	Handwerkliche Tätigkeiten, Fahrzeugerhaltung
shopping, other services	Einkaufen, sonstige Dienstleistungen
household management	Haushaltsmanagement
housework w.c.a.	Hausarbeit o.n.A
travel time associated with housework	Wege - Bereich Haushalt
Childcare	
childcare	Kinderbetreuung
travel time childcare	Wege - Betreuung Kinder
Market Work	
full-time job activities	Hauptberufliche Tätigkeit
paid side job	Bezahlte Nebenbeschäftigung/ Zweitberuf
other activities related to job	Sonstige Tätigkeiten bez. Beruf
job activities w.c.a.	Berufliche Tätigkeiten o.n.A
travel time job	Berufliche Wegzeiten
education	Ausbildung
further education	Weiterbildung
education and further education w.c.a.	Aus- oder Weiterbildung o.n.A
travel time education and further education	Wege - Aus- und Weiterbildung

* Originally, the Austrian Statistical Office subdivided the categories into over 300 subcategories with four levels of hierarchies. The subcategories provided in this table are the aggregates on the second level of hierarchy. Hence, there are much less than 300 categories displayed.

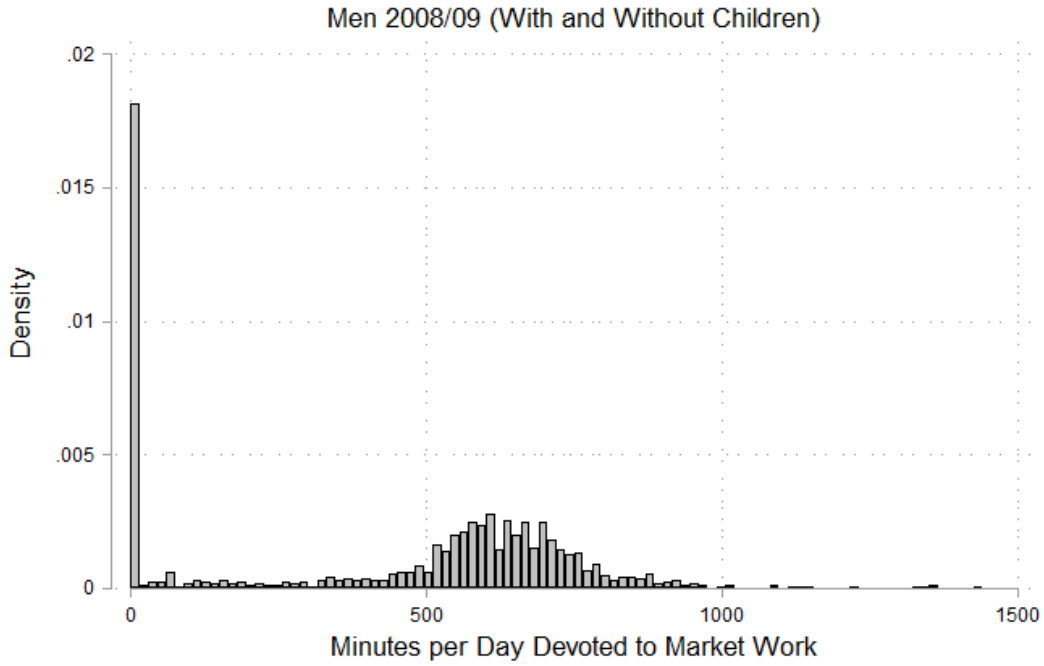

Figure A-6: Density Histogram: Men Market Work

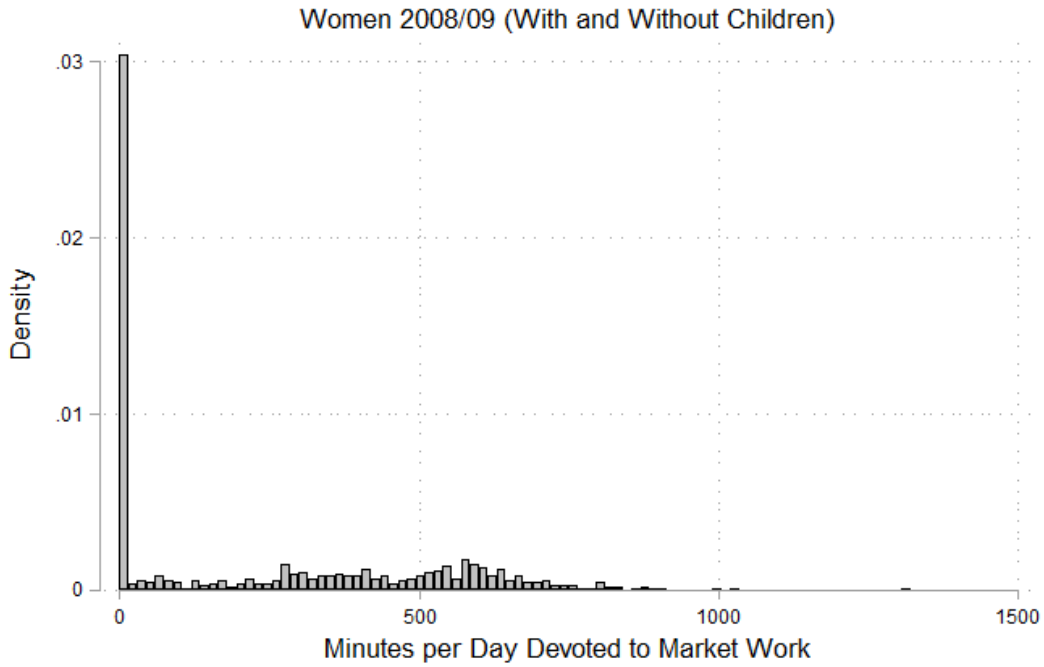

Figure A-7: Density Histogram: Women Market Work

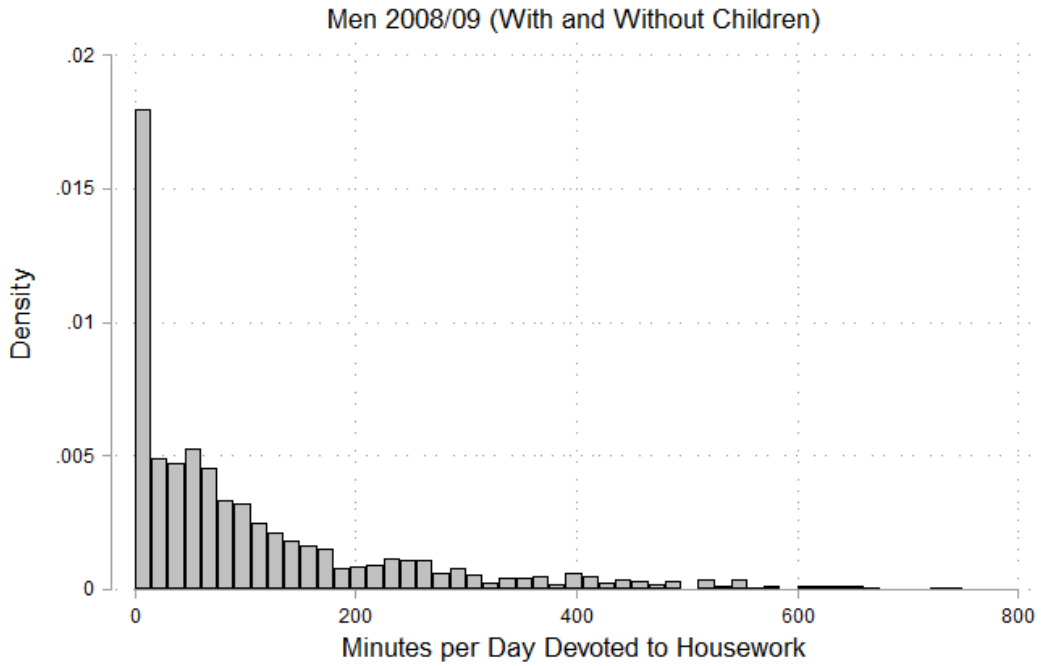

Figure A-8: Density Histogram: Men Housework

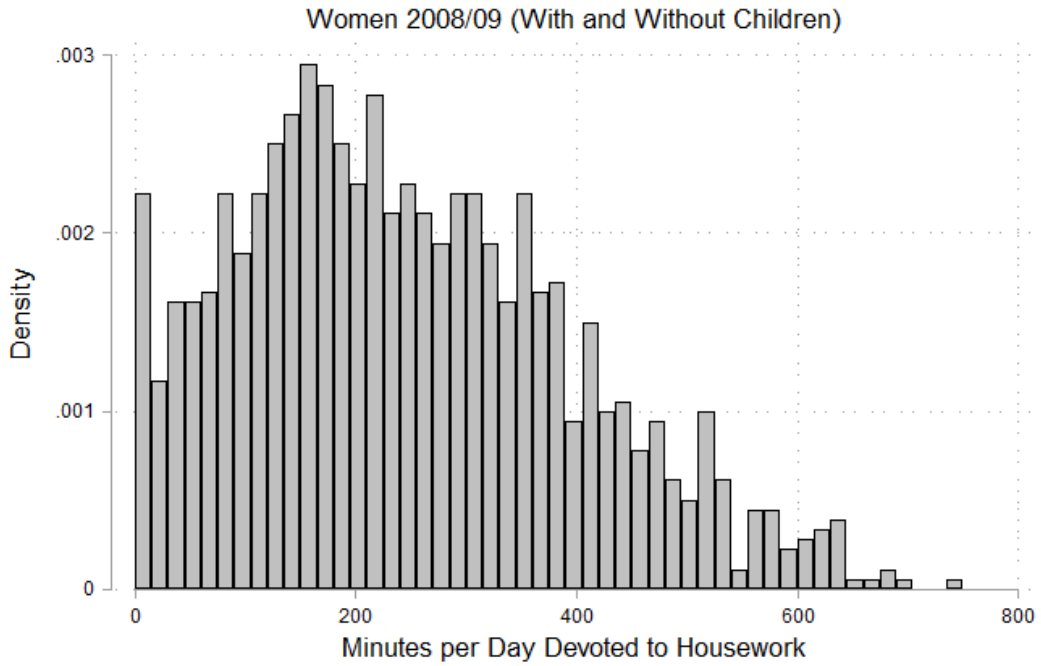

Figure A-9: Density Histogram: Women Housework

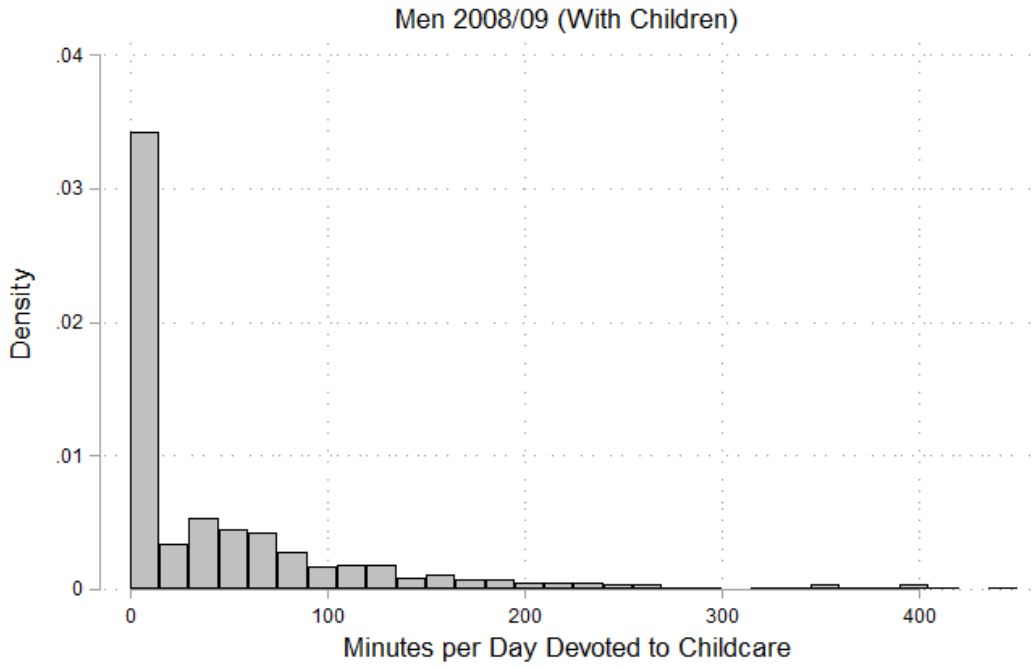

Figure A-10: Density Histogram: Men Childcare

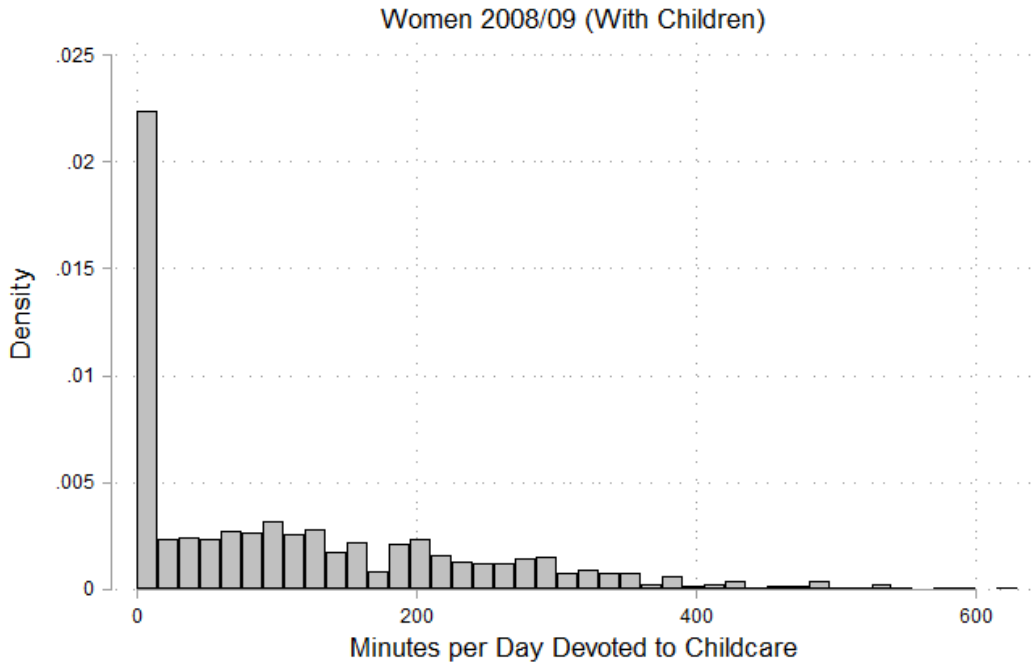

Figure A-11: Density Histogram: Women Childcare

Table A-11: Summary Statistics: Couples Without Children

Variable	Mean	Std. Dev.	Min.	Max.	N
Apprenticeship Woman	0.472	0.499	0	1	1319
High School Woman	0.12	0.325	0	1	1319
Tertiary Woman	0.055	0.229	0	1	1319
Age Woman	40.837	9.849	20	54	1319
Age Squared Woman	1764.596	750.501	400	2916	1319
Woman is Occupied	0.751	0.432	0	1	1319
Apprenticeship Man	0.667	0.471	0	1	1319
High School Man	0.124	0.33	0	1	1319
Tertiary Man	0.075	0.264	0	1	1319
Age Man	43.06	9.666	20	54	1319
Age Squared Man	1947.522	768.832	400	2916	1319
Man is Occupied	0.931	0.254	0	1	1319
Year 2008/09	0.227	0.419	0	1	1319
Living in a City	0.368	0.482	0	1	1319
Being Married	0.818	0.386	0	1	1319
Weekend	0.202	0.401	0	1	1319
Hours Market Work	11.679	7.538	0	32.5	1319
Hours Housework	5.507	3.641	0	24.25	1319

Table A-12: Summary Statistics: Couples With Children

Variable	Mean	Std. Dev.	Min.	Max.	N
Apprenticeship Woman	0.503	0.5	0	1	3368
High School Woman	0.106	0.307	0	1	3368
Tertiary Woman	0.079	0.27	0	1	3368
Age Woman	36.604	6.905	20	54	3368
Age Squared Woman	1387.486	515.743	400	2916	3368
Woman is Occupied	0.543	0.498	0	1	3368
Apprenticeship Man	0.647	0.478	0	1	3368
High School Man	0.114	0.318	0	1	3368
Tertiary Man	0.09	0.287	0	1	3368
Age Man	39.403	7.177	20	54	3368
Age Squared Man	1604.107	570.106	400	2916	3368
Man is Occupied	0.965	0.184	0	1	3368
Year 2008/09	0.267	0.443	0	1	3368
Living in a City	0.251	0.434	0	1	3368
Being Married	0.933	0.25	0	1	3368
Weekend	0.213	0.409	0	1	3368
Hours Market Work	9.528	6.324	0	33.25	3368
Hours Housework	6.524	3.391	0	26.5	3368
Hours Childcare	2.11	2.384	0	14.75	3368
Number of Children	1.711	0.781	0	4	3368
Age Youngest Child	8.856	5.476	0	18	2760
Youngest is a Girl	0.47	0.499	0	1	2723