WORK-LIFE BALANCE OF FEMALE PHD STUDENTS IN ENGINEERING

Veronika Paksi

ABSTRACT

In spite of tremendous efforts, women are still under-represented in science.[1] Their proportion compared to men is already lower in tertiary education and it further decreases in Research and Development (R&D) where we hardly find any women in top positions (She Figures, 2012). Reasons are multifaceted. Problems often start in the educational system, where women are often discouraged from choosing a science career. Their interest towards science starts to decrease during elementary school. Later, even those who chose 'A' level STEM courses at high school tend to apply for less male-dominated majors at university, such as biology or pharmacology; or they shift to social science and humanities (Paksi, 2014). The 'academic pipeline' is leaking during later career stages as well, and loses women to a greater extent than men. It is well documented that professional women tend to leave science mainly after obtaining their PhD (Etkowitz et al., 2000).

INTRODUCTION

Recent research (Xie & Shauman, 2003) has called attention to the multidimensional aspects of human life courses and that factors that affect careers are multi-levelled as well. Besides structural constraints and women's preferences, family background plays an important role in women's career orientation. Latest research (Mason et al., 2013; Hewlett, 2007) using the life-course approach has examined parallel life events in order to understand women's career related decisions more thoroughly. During early tenure track family- and especially childbearing-related difficulties and work-family imbalance have the most significant negative impact on women's career advancement. Though the majority of women face work-life imbalance regardless of educational or occupational field (Nagy & Paksi, 2014), in male dominated fields, such as engineering, they hardly find any female role models to follow and may receive less organisational support for balancing their work and family life (Evett, 1994).

However, a research career starts earlier than getting the first tenure track. Doctoral holders spend a long time in the educational system, often combining their studies with employment. This career stage has a great importance as far as their future career is concerned and may demand their full attention, to the detriment of private, and especially family life. Meanwhile, this life period usually overlaps with the 'ideal' time for family establishment (Hewlett, 2003). Higher educated women often delay their motherhood to an age that may well be 't00old' for the first childbirth (Paksi & Szalma, 2009). If they become a mother during their PhD studies, they should probably handle more than two life

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1 We use the word of 'science' for the natural sciences, similar to the expressions of 'Science, Technology, Engineering and Mathematics (STEM)' or 'Science, Engineering, Technology (SET)'.

domains. Considering the above mentioned, young researchers therefore often face balancing not just their studies and private life but, in addition, their work and childbearing at the same time. Each scenario may generate work-life balance problems already before tenure track employment.

Though some research called attention to youths already being aware of the work-life balance problems even during their university studies (Martinez et al., 2013; Engler, 2011), the majority of the research about women in science focuses on the tenure track period. Research scarcely examines early-stage research careers in terms of work life balance, or the possible effects of education.

Our paper therefore focuses on the work-life balance of female PhD students with special attention to the issue of childbearing. Firstly, we will introduce the theoretical background and discuss work-life balance theories relevant to our research topic. Then we will shortly summarise some main earlier research findings on the work-life balance of higher educated women. After showing some features of Hungarian society in relation to childbearing and PhD education, we will present our research findings. Based on qualitative interviews, an overall picture will be given on how PhD students in our research could or could not balance their work, education and private life in the field of engineering. It will be shown how their multiplied life domains and the heavy and multifaceted workloads hindered their work-life balance, especially childbearing, as well as how the field of science – in our case, the laboratory work – affected their balance negatively. After listing some limitations of our research we close the paper with a discussion of the research findings and with future implications.

BACKGROUND

Theoretical framework

There is a wide range of literature about the issue of work and family life balance. Research usually describes the relationship of the two life domains using the conflict (Greenhaus & Beutell, 1985) and the segmentation models (Roehling et al., 2003). Both theories consider work and family life as independent life domains. However, research concepts of middle-range theories have been changing continuously (Dén-Nagy, 2013) and there has been a significant shift in the research focus in the last decade. The main concept of the new models is based on the idea that work and family life are interdependent (Roehling et al., 2003). Recent research has been rather aiming at exploring the quality – both the negative and positive relations – between work and family, including (Edwards & Rothbar, 2000). Another line of research went beyond this approach and developed models that show how individuals are able to, and do form their own work-family interface (Clark, 2000). In this section, we introduce four main theories related to our research briefly.

The most widely used model for describing the relation of work and family life is Greenhaus and Beutell's (1985) work-family conflict model. It was mainly based on the role stress theory (Kahn et al., 1964) and emphasised the opposition of the two life domains. The authors formulated the notion of work-family conflict as follows: 'a form of inter-role conflict in which the role pressures from the work and family domains are mutually incompatible in some respect' (Greenhaus & Beutell, 1985: 77). The direction of the

conflicts is twofold, it can flow from work to family and in reverse, from family to work. The authors proposed three forms of the conflict based on their source. The first was the time-based conflict, when the time pressure of each life domain is incompatible with the other(s). Conflicts can arise when one life domain demands more time from individuals than they can devote to it. In the case of the strain-based conflict strains derive from the demands of the different roles in a way that one hinders complying with the demands of another. The third was the behaviour-based conflict, when a behaviour – related to a life domain's role – is incompatible with the expectations of other behaviours of another role. For example, a leading position at a pharmaceutical company requires – according to managerial stereotypes – certain qualities, such as self-reliance, conductivity, steadiness and rationality. Meanwhile, a family may expect a woman to be emotional, subjective and obeying. The conflict occurs when the person fails to adjust to these contradicting behaviours (Greenhaus & Beutell, 1985). Each form of the conflict implies the impossibility of the fulfilment of work and family-related roles at the same time.

Parallel to the work-family conflict model, the segmentation theory (Edwards & Rothbar, 2000) is also often applied to describe the relation of the two life domains. It is one of the earliest models, which claims that work and family life domains are relatively separated, therefore they do not affect each other. This theory was mainly relevant in the 1960s and 1970s, when work and family life were indeed separated physically, temporally and in their function (Rantanen, 2008: 10). Later research realised that work and family life are closely related and separation does not occur naturally. Instead, it is an active process, which is rather based on individual choice. Individuals keep the two spheres independent by suppressing their thoughts, feelings and behaviours. In this way they can avoid stress filtering from one life domain to another (Edwards & Rothbar, 2000: 181).

However, avoiding the flow of the different effects between work and family life is not easy. The basic idea of the spillover theory is that work and family life cannot be separated, roles belonging to life domains can coexist at the same time, and individuals carry different moods, emotions and skills from one life domain to another (Tammelin, 2009: 28). This is very similar to that described by the work-family conflict model (Greenhaus & Beutell, 1985). However, in the case of the latter, individuals carry these effects 'without a mediating role of subjective cause-effect evaluation', which demonstrates the incompatibility of work and family roles (Rantanen, 2008: 15). In the case of the spillover model, filtering effects cause similarities between the life domains (Rantanen, 2008). While earlier research emphasised the negative quality of these spillovers, recent research has started to focus on the positive effects that also filter from work to family, and in reverse. Scholars have developed different concepts according to the type of interaction, such as work-family positive spillover (Hanson et al., 2006), work-family facilitation (Frone, 2003) or work-family enhancement (Voydanoff, 2002). Greenhaus and Powell (2006: 72) summarised these concepts and used the term of 'work-family enrichment' for all these positive work-family interfaces. In their recent work they called attention to an important aspect: though the segmentation of the life domains may prevent the filter of the negative spillovers, it also impedes the flow of positive spillovers (Powell & Greenhaus, 2010: 525-529).

While the spillover theories are built on the concept that work and family domains affect each other, newest theories offered more complex models for understanding the work-family interface. The most frequently used model is Clark's border theory (2000) that argues – similar to the idea of the spillover theory – that work and family life are not

segmented; their borders are permeable. Permeability shows to what extent elements of a life domain can enter into another. The author calls individuals 'border crossers' who transit from one life domain to the other daily (Clark, 2000: 748). She gave an example that in the case of home office work the border is very permeable because family members can enter into it frequently (Clark, 2000: 757). This theory considers individuals not passive, but active actors, who are able to form their work-family interface to a certain extent by using different tools and are able to achieve a more or less balanced life.

These theories approach the work-family interface from the individual's point of view. However, the context of the work-family interface can also be researched at a) micro level, when only face-to face relationships are examined, b) meso level, when reciprocal effects between individuals and role partners are researched as well, c) exo level, when effects of a third life domain in which individuals are not involved is included, d) macro level, when the broader social context is also taken into account (Rantanen, 2008: 11).

Earlier research findings

Though having been a current and relevant issue, the work-life balance of women in R&D, especially in STEM fields remains a marginal topic in the social scientific academic discourse. In this section we briefly introduce some significant research findings on the topic. Research already reported that balancing work and family life is a continuous challenge for higher educated women (Moen & Sweet, 2010; Halrynjo & Lyng, 2009; Ridgeway & Correll, 2004). American studies based on thorough and representative large-scale research (Mason et al., 2013; Jacobs & Winslow, 2004; Hewlett, 2003) showed that female professionals, especially those who are married and have children are susceptible to slow career advancement or may abandon science. Besides quantitative research, qualitative data also confirmed that developing personal identities that incorporate motherhood and career is difficult for women in STEM fields. A multinational research (Herman & Lewis, 2012) involving European countries called attention to the particularly challenging nature of a motherhood and a sustainable career in the field of science, engineering, and technology. The authors summarised their research findings as follows: The 'evolution of mothers' perceived entitlements to be able to modify work for family reasons is rarely combined with a sense of entitlement to sustain career progression' (Herman & Lewis, 2012: 781). Interviews with professional women working at STEM fields (Mavriplis et al., 2010), and at a high technology engineering company (Evett, 1994) revealed that women face several cultural contradictions within male-dominated organisations that hinder their work and family life balance.

There are even less data on the work-life balance of graduate students. A representative survey carried out at a large university in the USA (Stimpson & Filer, 2011) showed that balancing school, work and family life was full of stress for the students, regardless of their martial status. The study pointed out that single students can be overburdened as well by compensating for the workload of those married counterparts that were having babies. Nevertheless, female graduate students, especially young mothers were less satisfied with their work-life balance than their male peers. They found the demands of time and the juggling of multiple roles the most hindering factors (Stimpson & Filer, 2011). The problem of the heavy workload seems to be a general phenomenon according to a recent large-scale research project in several European countries (Friesenhahn & Beaudry 2014),

where young academics reported 55 work hours a week, and the majority of the time was spent on teaching and administrative work instead of research. Another study (Haynes et al 2012) approached the problem from the issue of well-being. It showed that work and private life conflict of female PhD students negatively affected their emotional and physical well-being. Students in this research tried to develop different coping strategies and to find social support in order 'to be able to gain a certain sense of control' over their lives (Haynes et al., 2012: 12).

It can be seen that research usually introduces students' work-family interface in a way that is similar to that described by the conflict model (Greenhaus & Beutell, 1985) and work-life balance is a serious issue for women even during their under- and postgraduate studies. Juggling with the multiplied roles is a source of stress for the students and often generates conflicts in their relationships (Gold, 2006) or causes different health problems (Calicchia & Graham, 2006). Motherhood especially has a significant negative impact on students' work-life balance, similarly to the case of those young mothers already in the labour market.[2]

Hungarian context

In this section we briefly present those features of Hungarian society that are important in the contextualisation of our research findings.

Though socio-demographic changes that characterise the second demographic transition, such as a low fertility rate and delayed motherhood have already reached Hungary, attitudes towards family have hardly changed. Hungarian society is still family-oriented: the majority of society still considers family more important than work (Pongrácz & S. Molnár, 2011) and that mothers should stay at home with their child up to the maximum length of the parental leave that is three years in Hungary (Blaskó, 2005). The process of re-familization and the backlash against women's emancipation (Nagy, 2009; Křížková et al., 2010), as well as strong traditional family roles and gender attitudes all hinder women's career advancement, especially in male-dominated fields. Women's representation in the field of engineering is very low (She Figures, 2012): it is around 30% among PhD holders, and 21% in R&D (KSH, 2010-11).

Research focusing on the work-life balance of students in tertiary education is scarce in Hungary. A regional large-scale survey (Engler, 2011) on graduate students' career and private plans revealed that youths even between the age of 18 and 24 paid a considerable amount of time to the issue. Though a significant part (40%) of the students was family-oriented and planned family formation after graduation, every fifth student seemed to be 'career-centred'; they planned to delay their family establishment to their mid-thirties.

The first research in the field of engineering in Hungary was carried out in 2012 and used mixed research methods (Szekeres & Krolify, 2013). Its quantitative data showed a higher proportion, 36% of career-centred undergraduate students with only slight gender differences. In addition, the qualitative research revealed that undergraduate women engineers already counted the years how they could become a mother at a young age and establish a stable career before childbearing (Takács et al., 2013: 147).

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2 Nevertheless, young mothers' educational performance in tertiary education is often higher than that of their childless counterparts' (Engler 2013)

However, higher educated women in Hungary – similarly to in Western countries – also postpone their motherhood.[3] Their average age at their first childbirth was more than 31 years in 2013 (KSH, 2013). A regional survey on PhD students (Fináncz, 2007: 493) revealed that students' postponing family formation was mainly due to financial and career-related reasons, or – particularly in the case of women – the lack of a stable partner. It was an interesting result that almost half of the childless students in this research did not plan any family at all.

Teachers can significantly form students' attitudes towards family roles, by which they can influence their career orientation as well (Margolis, 2001). The before mentioned mixed-method research (Szekeres & Krolify, 2013) called attention to engineering teachers at this university disseminating very traditional family and gender roles. (Szekeres & Krolify, 2013). Moreover, though the issue of work-family balance was not directly addressed, female teachers – based on their own experience – concluded that career and motherhood cannot be reconciled in engineering and IT. It gives a food for thoughts that hardly any of them thought that this situation should be changed (Nagy, 2014: 147-149).

Summarising the Hungarian situation, we can say that though the strong traditional attitudes towards family roles are still strongly present in Hungarian society, the value of paid work and a career is increasing, especially among higher educated individuals (Pongrácz, 2011). This implies that the role of work-life balance has been increasing in the lives of women in tertiary education and in R&D. Nevertheless, male dominated fields seem to resist these changes more, as is the case in Western countries.

METHODOLOGY

Based on the literature introduced above we aimed to explore how female PhD students balance their studies, work and family life in the field of engineering.[4] We conducted 11 semi-structured interviews with female PhD students under the age of 40 in a doctoral school in Budapest in the field of chemical and biological engineering. We conceptualised 'PhD student' as individuals who are enrolled in doctoral schools, within the official time limit of the programme and have not received their degree yet.

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3 This phenomenon started already before the political system change (Tóth, 1993).
4 Further sub-questions of the PhD research were: What facilitating and constraining factors do female PhD students in engineering identify in relation to their work-life balance? Are there special characteristics of education and working in engineering that affect this balance? How does PhD attendance affect their timing of the first childbirth? In this paper we introduce some main characteristics of students' work-life balance.

Sample description

Nr	Age	Martial status	Parental status	PhD status	Workplace	Lab. work
1	24	Single	Childless	State fellowship	Does not work	Yes
2	28	Married	1 child	State fellowship	Academia	Yes
3	31	Single (Cohabits)	1 child	State fellowship	Academia	Yes
4	28	Single (Cohabits)	Pregnant	State fellowship	Academia	Yes
5	28	Single	Childless	State fellowship	Academia	Yes
6	26	Single (Cohabits)	Childless	State fellowship	Does not work	Yes
7	31	Single	Childless	State fellowship	Other public institute	Yes
8	25	Single (Cohabits)	Childless	Industrial fellowship	Does not work	No
9	28	Married	Childless	State fellowship	Academia	Yes
10	28	Single (Cohabits)	Childless	Industrial fellowship	University	No
11	29	Married	Childless	Industrial fellowship	Industry	Yes

The number of female PhD students in engineering is limited. We reached all the students via email and included all those who replied positively to our request. This may result in a biased selection of the population, however, this provided us with information-rich cases of interest where individuals have specific knowledge about the topic (Creswell, 2007: 125). We applied template analysis for the analyses. Hierarchical coding was used where similar codes are clustered together to generate more general, higher-order codes (King, 2004).

At the beginning of the interviews, we applied the overall appraisal approach (Grzywacz & Carlson, 2007) in order to gain an understanding of what work-life balance means to them and how they perceive their work-life balance in general. After some introductory questions we applied the components approach during the interviews (Grzywacz & Carlson, 2007), aiming to explore students' present work-life balance and their future balancing plans in detail.

RESULTS: Work-life balance of female PhD students in engineering

The interviews highlighted several facets of how female PhD students in our research balanced their work, studies and private life. They identified several constraining and facilitating factors in relation to their balance. In this section, firstly, we give a short summary of their work-life balance in general. Secondly, we will show how the multiplied life domains and the multifaceted workloads hinder their balance, especially their childbearing. Finally, we will introduce the negative role of laboratory work in the work-life balance of these students.

Work-life balance in general

By work-life balance students usually meant having enough time for their activities and separating their work and private life. We used the term of work-life balance during the interviews, where life included all activities in the private sphere beyond family. However,

interviewees mainly spoke about their family life and rarely mentioned other, e.g. leisure activities. Family usually included partners, children and/or parents.

When students were asked about their work-life balance in general, they reported a mixture of a quite good balance and poor balance. Those students who found their lives quite well balanced were typically childless and they did not work in the labour market in parallel with their PhD education. Those who were dissatisfied with their work-life balance were rather young mothers, or already worked in the labour market. When students' work-life balance was inquired about in detail, answers gave us a more nuanced picture and showed that work-family balance is a serious issue for these young researchers.

The majority of the students were childless at the time of the research. Their perception and experience can provide us with a quite clear picture on how they balanced their work, studies and private life without parental obligations. However, all these students – even the single one who wanted to remain childless – had a firm opinion about how motherhood may or may not compatible with academic career. The issue of childbearing therefore will be discussed in the following regardless of parental status. Hence, we will notify the parental status where it is relevant.

Multiplied life domains and multifaceted tasks

PhD education was not a time for recess for the significant majority of the students we interviewed; they were fully devoted to their profession. They tackled the multifaceted tasks of their different life domains that often characterise early-stage professional careers. We found significant differences in students' work-life balance according to how many and which life domains they handled in parallel.

Balancing 'only' PhD studies and private life seemed to be less burdensome compared to life situations that involved more than two life domains. These students belonged to the youngest cohort and lived with their parents or had just left the parental home. They were quite satisfied with their lives, however, some later confessed that household chores were quite challenging in terms of time management.

The significant majority of the PhD students in our research worked in parallel with their PhD studies. The presence of a third life domain especially put a constraint on students' work-life balance for each life domain required a full time role. This childless woman well summarised the time squeeze and the fatigue she felt even before childbearing:

'Although I don't have any children yet, sometimes I have no idea which way to look. In my opinion a job is already full time, and if you're a woman there is the household and stuff, which also requires energies full-time. And then there is the PhD…. (nr 11)

Work and PhD related tasks often overlap in the case of public employment at a research institute or university, but scarcely at a pharmaceutical company. Nevertheless, students usually had to meet the multiplied and multifaceted requirements of young researchers' work in both cases, such as course work, exams, PhD research, workplace research, publications, conferences and a huge amount of teaching and administration tasks. We can well understand their struggle well described in the next quotation. This student working at a research institute considered switching to industry due to overwhelming work and stress. Her words showed how high students (would) rank the issue of the dissertation-writing compared to their other obligations, and how it was subordinated by the need and interest of the organisation.

'At our department every PhD student and actually every colleague has tasks that support operation and tuition […] at the expense of writing the dissertation. I'm so stressed about everything, the exam period, the deadlines […] I can't imagine how I could manage all this (childbearing during a PhD course); […] hard work every day, stress, conferences, semester closing, semester opening, educational issues.[...] and I don't feel like doing this.' (nr9)

Moreover, it was not unusual that former tasks of students on parental leave were delegated to other students instead of employing a substitute for this period of time. This produced additional extra workloads that might generate tensions between colleagues.

'All the work of a colleague, who left to found a family, has been transferred to me. I also got the tasks of another colleague who left for America, and I am really fed up […]' (nr9)

There was a strong agreement among women we interviewed that work-life balance is of a lesser concern for men in their profession. Firstly, though we found examples of more equally shared family obligations between partners, men were not the primary care givers in their families and household chores were typically not their responsibility.[5] Secondly, students based their opinions on their experiences of their male colleagues. A woman who had only male colleagues framed her opinion in a way that showed men usually not just faced fewer household chores but they handled obligations of the multiplied life domains with more ease and less effort:

'I see my colleagues – all my colleagues are male – I cannot see problems that, oh my God, there is a pile of clothes for ironing waiting for them, but there is a lot to do at the university here as well. I think men are looser. And I don't know, I don't see that it would burden them that they have to fulfil more commitments.' (nr8)

As we mentioned above, having enough time for all activities was a criterion of the students for a balanced life. However, they often failed to achieve this goal, similarly to the other one: separating their education and work from their family life. Though in some cases they verbalised part successes, such as not speaking about work at home and vice versa[6], they could not separate their life domains in other terms.

Firstly, frustrations, stress, tiredness and the lack of time for family life due to the overburdening obligations often caused tensions in their private life. A young mother explained this as follows:

Unbelievable what can come up, they (students) totally upset you, therefore I go home in such a manner, obviously I try not to take this out on my family , but this causes insomnia, I am just turning in my bed, can't sleep, and from here my performance at my workplace the next day is like… (nr3)

Some parts of the heavy workloads are based on inner needs and are hardly measurable. PhD students often mentioned the need and demand for 'continuous creative thinking' and for 'being always up-to-date' in their research field. Both required huge amounts of time investment that was well beyond their working time that often characterises professionals' work. On the one hand, students voluntarily devoted their leisure time to these activities in spite of their wish to separate their work from private life. On the other hand, it caused tensions when it prevented them from spending quality time with their families, and in some cases, this was partly responsible for breaking up their stable partnerships.

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5 At this point we should note that educational homogamy (the same level of the education of the partner) was typical among students. In our case, even the field of education (engineering) was the same as well.

6 Not to speak about family issues at workplace was relevant when the partner of the interviewee worked at the same workplace.

Secondly, the boundaries between work and private sphere were often blurred. Participating in PhD education and employment in the public sector provided students with more or less flexible working conditions. On the one hand, students could utilise the advantages of the flexible working hours and the home office. They could use working time for arranging – only – important private issues quite easily, or could work at home e.g. if their child was/would be ill. On the other hand, they experienced the disadvantages of this flexibility: overwork and use of the home office even during the weekends was typical. Nevertheless, flexibility was flexible up to the point of the need of the organisation. Students scarcely mentioned the possibility for part-time jobs, and if so, they only considered that during the parental leave for it would mean a lower salary at the same time.

Moreover, we have found a special effect of the field of education on students' work-life balance. The majority of the students' work included laboratory work. This significantly and negatively influenced their work-life balance, for it was inflexible in terms of time. It required a thorough planning of the measurements if students did not want to spend their leisure time in the lab. However, PhD students often failed[7] to finish their lab work by the end of their working hours, moreover, they often went to their university or workplace in the weekends to start or end a measurement. Going into the lab out of working time made them to 'cross the borders' between their work and family life domains frequently. In was interesting to see when the partner was an engineer as well, this caused little problem between the partners.

Childbearing

Becoming a mother in parallel with PhD education implies handling a new additional field of life. From the interviews it became obvious that even if students' life was quite balanced, childbearing definitely had changed or would change this equilibrium. These women were eager to share their dilemmas and concerns in relation their motherhood (plans)[8] that had been worrying them for years. They especially pondered at what age they should become a parent, when to interrupt their career, and how they would be able to reconcile childbearing with education and work.

The majority of the students considered the second half of their 20ies an 'ideal' period for having the first child, and over 30 't00late' for it. Therefore the years of PhD education seemed to be a good option for them as far as the ideal age was concerned. However, they found childbearing hardly reconcilable with PhD education and work, for each of them required full time and attention and each of them was full of stress – as we discussed earlier. A childless woman who had been working at a pharmaceutical company for six years gave us an excellent summary of the situation. It was telling that in the six years she had never heard of an example of a woman who had been successfully raising a child during PhD and had worked in industry at the same time:

'[…]and the child requires again full-time attention, so I really don't have a clue how I will manage all that. I think if you have a job, and also do a PhD and have a kid, you will easily lose control. It's very difficult to do a PhD and raise children as well as work. I don't

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7 Measurements are often unpredictable in terms of their duration and results.
8 Except for one interviewee, who voluntarily wanted to remain childless for she did not want to 'give up' her very well balanced work and private life.

even know anyone who could pull it off.' (nr 11)

Students sometimes stated that career and childrearing were so incompatible and felt they had to choose between career and motherhood. This 25 year old woman addressed exactly this problem that showed how female life courses differ from men's in R&D:

'My fiancé is all enthusiastic about it, but actually he won't have to quit his job. So when I decide that I'm willing to give up my professional career, we can immediately have a baby.' (nr8)

This obvious conflict between work and private life often forced these women to further delayed childbearing, decrease the desired number of children, and in a few cases abandon their career plans. For example, the above mentioned student was planning to rather have her first baby during PhD education unless she would become t00old for motherhood. It was her well deliberated decision not to start a career in R&D in parallel with her PhD because she found it irreconcilable with motherhood. However, she experienced so much uncertainty in relation to a career break during PhD education as well, that she could not bring herself to adecision.

'My future career is uncertain in connection with this, because I don't know how I could leave, how I could return, how I could carry on, and who will say what to that. [...] things like that make me feel insecure.' (nr 8) [...] 'This is exactly why I didn't start a career anywhere, because I felt it could have been either the career or the children. But not both at the same time.' (nr8)

Women in our research experienced uncertainty in different life segments. This woman was uncertain how to return to the labour market after a career break and did not have any idea how she would be able to continue her work. She was even preoccupied by the thought what attitudes her environment would show towards her career break, because decision makers in this profession are usually men. This reflects the still prevalent discrimination of young mothers in R&D, especially in male dominated engineering. Moreover, she definitely expressed her concern about the devaluation of her professional knowledge whenever she takes the maternity leave.

This latter concern was widely shared among students, who added that the demand for being always up-to-date was especially difficult in the case of young mothers, for international conferences and scholarships were hardly reconcilable with their family life. Meanwhile, network building is one of the most important features of researchers' socialisation (Shaw, 2004: 39).

Reconciliation of work, studies and childbearing seemed to be difficult not just at the level of planning. A mother with a young child continuously faced a lack of time that often forced her to choose work over family. Stress was daily present in her life and she found this time squeeze unsolvable in spite of having a partner who took his share of the household chores. However, her last words referred to the traditional family roles, which she did not share but yet accepted.

'My day is always full of continuous stress and hurry. I am always behind with my household chores, or my work, or I cheat and chose the shortest tale to tell my child. I suffer from continuous lack of time, and I am afraid that it could be solved only in if a day was 34 hours instead of 24. I often see this problem as unsolvable, though my partner takes his share in the household chores as much as you can expect that from a man'.

Later she was quite straightforward and concluded that childbearing was a serious obstacle to her career. This experience hindered her from realising her fertility plans.

Initially she had planned three children, but confessed it was a 'silly' idea of hers. Her words hinted that a second child at least should be born in order to have a sibling to her daughter.

I feel now how difficult a pledge it was to study in parallel with a family. To put it roughly, it is an obstacle that I have a young child' (nr3)

We saw earlier how the laboratory work influenced students' time schedules and melted the boundaries between life domains. However, the majority of the students' laboratory work involved hazardous chemicals, which put a further significant constraint on women's work-life balance. Firstly, it strongly determined the timing of their childbearing. Even when some students considered the years of PhD education suitable for childbearing, they were not able to reconcile such a pregnancy and breastfeeding with the risk of exposure to hazardous chemicals (Bellingham & Sharpe, 2013). Secondly, they cannot be cautious enough: even if they adhere to every safety protocol and regulation rigorously, accidents can and do happen. The following two quotations show the seriousness of the health hazards:

'As for me I learned about my pregnancy rather late, and I accidentally knocked over some carcinogenic solvent in the lab before I even knew. Well, the baby was affected a bit, but it was only for one or two days.' (nr 4)

'[…] women they had better have children as soon as possible, because no matter how careful we are about health and safety, these chemicals do not make childbearing any easier.' (nr 5)

DISCUSSION

Our results clearly showed that the problem of balancing work and private life is present as early as PhD education. Multiplied life domains, such as motherhood and/or labour market activity in parallel with PhD studies – cases when young researchers had to handle more than two life domains at the same time – had further significant negative impact on students' work-life balance. In harmony with Friesenhahn and Beaudry's study (2014), overwhelming work characterised our young academic incumbents' lives as well at this very early-stage professional career. Each life domain of the students demanded a full role with multifaceted tasks that often caused time squeeze and stress for them. Our results confirmed an earlier raised issue (Stimpson & Filer, 2011) that apart from mothers, single students can be overburdened by shouldering their married counterparts' work. Moreover, though students had the autonomy to schedule their obligations, their needs were often subordinated by the need of the organisation.

Professional women usually do not want to separate their work and private life (Sturges, 2012) therefore it was interesting to see how strongly these young researchers wished that the beginning of their career. This need is similar to what segmentation theory (Edwards & Rothbar, 2000) described: students protected their balance by expelling the negative effects of one field to another. However, PhD students in our sample could just rarely realise this goal. Results rather tended to confirm the spillover theory (Roehling et al., 2003): in spite of their efforts, students often experienced work-related stress filtering into their family life. The permeability of the border of students' life domains proved to be high, especially if they worked in the public sphere. Research institutes and universities usually

provide more flexible working conditions than industrial companies. However, we found the role of flexibility unambiguous, as it is often discussed in the international critical discourses (Fursman & Zodgekar, 2009: 53). Though students were allowed to schedule their tasks quite freely, they worked overtime and used the home office in order to cope with the overwhelming work. In addition, laboratory work that characterised chemical- and bioengineers' work played an important role in work-life balance: no matter how flexible the working conditions were, the inflexibility of lab work was definitely a curb on it.

We saw that family establishment and PhD education overlap in our interviewees' lives as well (Mason et al., 2013). However, work and family life often seemed to be irreconcilable with studies, even when students had only planned their motherhood. The continuous lack of time and the stress they reported exactly referred to the time-based and the strain-based work-family conflict model described earlier in the theoretical part of this paper (Greenhaus & Beautell, 1985). In addition, these PhD students rather delayed their motherhood than facing unpredictable and uncertain labour market conditions. Nevertheless, students were fully aware of the age norms and the biological limits of motherhood that forced them to compromise between the ideal timing of childbearing and the less bad timing of a career break. Laboratory work, especially using hazardous chemicals proved to be a more serious obstacle to women's childbearing as well. Our research showed that female researchers are not just at a greater risk in a lab (Bellingham & Sharpe 2013), but this had a significant negative effect on the work-life balance of the students and of any women in this field. When women decided to have a child, or not later than when they learned about their pregnancy they had to quit laboratory work. The timing of this career break should be well deliberated, considering the tradition both of the long parental leave and at least six-months of breastfeeding in Hungary.

Results confirmed the findings of other Hungarian and Western countries data (Nagy, 2014; Jacobs & Winslow, 2004) that life courses are still highly gendered in R&D. On the one hand, the preference for traditional family and gender roles both at the work place and in private life were definitely obstacles to women's work-life balance. On the other hand – according to these women –, they rather facilitated, or at least did not hinder the work-life balance of students' partners and their male colleagues. Furthermore, men, unlike many of the women in our research, were hardly forced to choose between parenthood and career. Students agreed on that childbearing slows the academic career of women by hindering the mobility and collaborative network building of young mothers. Meanwhile, these tools are especially important elements of the early career establishment for researchers' 'social adaptation' (Shaw, 2004: 39). Young mothers are therefore often excluded from this network building, as our interviews showed accordingly.

In sum, PhD students with or without children in our research faced different difficulties in relation to their work-life balance regardless of how they perceived and reported their balance in general. Tools and strategies for achieving a balanced life were so different that it is difficult to describe them with a single theory or model. Those students, who found work and private life more or less reconcilable, balanced their life in a way that can be described by Clark's border theory (2000): though they could not change their life domains radically, they were able to form them to an extent, achieving a more or less balanced life. However, the others, who reported poor work-life balance or the incompatibility of the two life domains made huge efforts to ease the conflict between their work/studies and private life. In a way, they also 'fought' for their balance, even it was meant 'tilting at the windmills'.

CONCLUSION, LIMITATIONS AND FUTURE IMPLICATIONS

Based on the discussion we can draw a conclusion that the work-life balance of female engineering PhD students in our research can be described mainly by the conflict theory (Greenhaus & Beautell, 1985). Students especially had a strong need for balancing their work and family life, however, it seemed they are not able to achieve that on their own. There is a need for exploring the structural barriers to women's professional advancement (Gill et al., 2008: 401) during early career-stage as well, such as PhD education. Nonetheless, educational institutions and workplaces should reflect on themselves as well, and assess how support can be given to these young researchers.

One main limitation of the paper is that it only showed the main features of the work-life balance of these students. Further research findings of this research project is under publication, such as the timing of PhD education and the first childbirth; facilitation and constraining factors in relation to childbearing; the possible differences in the work-life balance of students in chemical/biological engineering and in mechanical/electrical engineering; as well as the sectoral differences. Another limitation of this research is that the results cannot be generalised, they describe the main features of the very small group of female engineer PhD students in Budapest, Hungary. Future research may therefore explore the regional differences in the work-life balance of PhD students, and other STEM fields.

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