

THE INDEPENDENT WOMAN - LOCUS OF CONTROL AND FEMALE LABOR FORCE PARTICIPATION*

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Abstract

Research on female labor force participation has a long tradition in economic research. While many open questions have been answered on the gender gap in labor market participation, the prevalent heterogeneity between women still keeps economists busy. While traditional economic theory attributed unexplained differences in decision-making to idiosyncratic shocks, modern empirical approaches are more and more interested in investigating this psychological black box behind participation decisions. This paper contributes to this research by discussing the role of the personality trait locus of control (LOC), a measure of an individual's belief about the causal relationship between own behavior and life's outcomes, for differences in participation probabilities between women. In line with the existing literature, an important role of LOC for independence preferences as well as subjective beliefs about returns to investments are proposed. The connection between LOC and participation decisions is tested using German survey data, finding that internal women are on average more likely to be available for market production and this higher availability also translates into higher employment probabilities. Additional analyses identify a strong heterogeneity of the relationship with respect to underlying monetary constraints and social working norms.

Keywords: Locus of Control, Labor Supply, Female Labor Force Participation, Social Norms, Personality, Preferences, SOEP

JEL codes: D91, D13, J21, J22, J16

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1 Introduction

The research on female labor force participation has a long tradition. Triggered by the growing labor supply of women in the second half of the last century¹, a large strand of theoretical and empirical research on this new issue has arisen. Nevertheless, the early literature on female participation in the labor market was largely concentrated on gender gaps in monetary constraints as well as social norms of working in order to explain differences between the participation decisions of men and women. Based on this literature, we already know a lot about why women keep on having lower participation rates and wage elasticities than men and why these variables started converging in the past decades.² However, differences in the participation probabilities between women can only be explained by differences and trends in monetary constraints as well as social norms of working to a limited extent. While traditional economic models largely attribute these unexplained differences in decision outcomes to idiosyncratic shocks or unobserved constraints and opportunities, modern behavioral economic and applied microeconomic approaches started to investigate these differences with respect to unobserved, inherent beliefs and preferences. A growing literature is thus interested in investigating the psychological black box behind female labor supply decisions as well as, in a more general sense, individual decision making on the labor market altogether.

This paper contributes to the literature by investigating the role of a specific personality trait, which has already been found to have important explanatory power for decision making especially on the labor market: an individual's perception of control, also called locus of control (LOC). LOC can be characterized as a *“generalized attitude, belief, or expectancy regarding the nature of the causal relationship between one's own behavior and its consequences”* (Rotter, 1966) and describes whether individuals believe in the effects of their own efforts and abilities on their lives' outcomes. While individuals with an internal LOC (internals) believe that their own efforts and abilities are rewarded in their future life's outcome, individuals with an external LOC (externals) attribute life's outcomes mainly to luck, chance, fate or other people. LOC has already been shown to have important effects on economic behavior and decision making on the labor market³. Nevertheless, to the best of my knowledge, no paper exists yet which investigates the effect of LOC on female participation decisions in a comprehensive and detailed manner.

Based on an one-period model of discrete labor supply decisions, which allows for heterogeneity in preferences through the incorporation of a vector of personal attributes into the individual

¹ See Killingsworth and Heckman (1986), Blau and Kahn (2007), Costa (2000), Goldin (1990) and Mincer (1985) for comprehensive overviews over the trends in female labor force participation during the 20th century.

² See Section 2 for a detailed overview over the literature.

³ See Cobb-Clark (2015) for detailed discussion of the concept as well as an overview of the literature on LOC in labor economics.

utility function, the theoretical considerations mainly discuss an effect of LOC on participation probabilities via a difference in the direct marginal utility from participating. In line with a similar argumentation in Cobb-Clark *et al.* (2014) for the effect of LOC on health investments, women might not only derive utility from the consumption level generated through participation but also from the act of generating this consumption level itself. Based on the psychological literature which makes an important connection between locus of control and independence considerations, this direct non-monetary gain from participation is expected to be higher for internal women. Internals put a greater weight on the status of being active in the labor market as they not only derive utility from the consumption level as an outcome of participation but also from the fact that they themselves had control over the generation of it. Additionally, potential alternative mechanisms, which can largely be formalized by differences in the individual budget constraints, are discussed. LOC might, for example, have an effect on beliefs about returns to investments, such as parental investments, job search and investments into the future career, but also on objective differences in the opportunities and constraints, e.g. wages or family income.

Therefore, in the empirical part of the paper, I estimate the direct relationship between LOC and current labor force participation of a woman in a reduced form approach. The estimations are conducted using the extensive information available from the Socio-Economic Panel (SOEP, 2017), a large representative longitudinal household panel from Germany. The SOEP not only includes detailed socio-economic information but also surveys individuals' locus of control on a regular basis. Using this data, I estimate the average marginal effects of a woman's LOC on her probability of participating in the labor force using a random effects logit estimation conditional on standard socio-economic determinants of participation. In this context, labor force participation is defined as a general availability for market production and thus concentrates on the behavioral implications of LOC on labor supply decisions. I find a significant positive relationship between having an internal LOC and being available to the labor market. A subgroup analysis reveals that while a strong relationship can be observed for cohabiting women and women with (young) children, the effect for childless women is distinctly lower or even close to zero, depending on family status. This indicates a crucial heterogeneity with respect to underlying monetary incentives to work which is additionally supported by findings on similar heterogeneity with respect to the available family income in the household. In addition, a second heterogeneity analysis displays that the estimated effects are also sensitive with respect to the underlying social norms of working as measured by regional differences as well as cohort and time trends. Furthermore, additional analysis reveals important differences between labor market participation decisions at the intensive and the extensive margin. While the positive

effect on labor market availability also translates into higher labor market activity, as measured by employment probabilities, for all considered sub-groups. The increased activity can only be observed at the extensive margin. For those women who do work, LOC has no significant effect on working hours.

Consequently, it is the objective of the paper at hand to contribute to the existing literature on the important economic implications of locus of control and to provide additional empirical evidence on the drivers of women's labor supply decisions. Hence, the paper's main contribution is to add valuable insides to the approach of getting closer to the bottom of the psychological black box behind female labor force participation decisions by explicitly considering labor supply decisions as the result of a woman's inherent personality traits. In so doing, the paper has two important findings. On the one hand, the paper empirically identifies important behavioral implications of locus of control in women's participation decisions above and beyond traditional monetary incentives and disincentives. On the other hand, especially the heterogeneity analysis is able to give an idea of how strongly a woman's preference-driven labor supply decision is limited by budget constraints as well as exogenously determined social norms. The second finding is likely to hold true in general, independent from the considerations about locus of control in the present analysis.

The outline of the paper is as follows. Section 2 gives a comprehensive overview over the related literature. Section 3 summarizes the theoretical idea of the paper and, based on this, proposes hypotheses for the empirical analysis. In the empirical part of the paper, Section 4 describes the data and the estimation strategy and Section 5 presents an overview over the results of the main estimation, the heterogeneity analysis as well as the additional results for alternative outcome variables. Section 6 summarizes a number of tests for the robustness of the results. Section 7 concludes the paper.

2 Literature Review

The paper at hand significantly adds to two important bodies of economic literature which are on the one hand the literature on female labor force participation, including determinants of participation, overall time trends and gender differences, and on the other hand the growing literature on the economic importance of personality traits in general and the personality trait locus of control in specific.

The early literature on female labor force participation largely focused on the explanation of decreasing gender participation gaps as well as the positive long-term trends in female labor force participation. Inspired by the work of Mincer (1962), especially the increase in the average

wage rate of women was in the center of attention for a long time (see e.g. Mincer, 1985; Smith and Ward, 1985; Blau and Kahn, 2007; Juhn and Murphy, 1997). Large parts of this decrease in wage inequalities were explained by increasing returns to human capital for women (see e.g. Autor *et al.*, 2008; Blau, 1998; McGrattan and Rogerson, 2008). Although the wage rates of women and men did converge and the female wage elasticity fell over time (Blau and Kahn, 2007; Costa, 2000; Heim, 2007), the participation rate and the average number of working hours per week of married women in particular are still considerably lower than that of their partners and the gap in wage elasticities is also still clearly recognizable (Evers *et al.*, 2008; Blau and Kahn, 2017). Based on the growing theoretical considerations of joint family labor supply, empirical studies additionally found a strong and stable response of female labor supply to changes in their partners' wages, whereas no such responsiveness can be identified for men (Ashenfelter and Heckman, 1974; Lundberg, 1988; Devereux, 2004). In addition to considerations about wage and cross-wage responses of female labor supply, the conventional theoretical models were largely focused on overall declines in fertility rates through, for example, the improvement of fertility control (Goldin and Katz, 2002; Bailey, 2006), the improvement of household technologies (Greenwood *et al.*, 2005), the rise of the tertiary sector (Cortes and Pan, 2018; Weinberg, 2000; Oppenheimer, 1970) and a generally increased economic demand (Angrist, 2002; Carodso and Morin, 2018) in order to explain the observed positive trends (see e.g. Costa, 2000; Blau and Kahn, 2017; Mincer, 1985; Smith and Ward, 1985).

Over the years, multiple new strands of research have evolved, which to a large extent have focused on alternative monetary factors behind (the lack of) female labor force participation such as institutional barriers and public policy (e.g. tax incentives, transfer withdrawal rates and childcare provision) (see e.g. Blundell and MaCurdy, 1999; Hausman, 1980; Eissa and Liebman, 1996) as well as costs of participation in general (e.g. transportation and childcare) (see e.g. Cogan, 1980; Gronau, 1973; Angrist and Evans, 1998). However, as summarized by Blau and Kahn (2007, 2017), all these conventional economic studies were not able to fully explain the observed trends in female labor force participation and the remaining gender gaps. Consequently, the economic research started to consider non-economic determinants of the developments, especially by discussing and empirically analyzing the role of social norms and gender role attitudes as important non-pecuniary factors (see e.g. Bertrand, 2010; Fortin, 2015; Goldin, 2006; Reimers, 1985; Costa, 2000; Carodso and Morin, 2018). This literature is in line with the sociological literature on the transformation of traditional gender roles over time (Cotter *et al.*, 2011; Ross *et al.*, 1983). As stated by Goldin (2006), one key aspect of the “*quiet revolution of women's employment*” since the 1970s is the increasing importance of work as a key aspect for a woman's

social identity. These considerations are based on the economic and sociological research on the importance of social purpose as well as economic identity and status as non-pecuniary incentives of labor force participation (Jahoda, 1981; Akerlof and Kranton, 2000).⁴ Traditional gender roles and the associated gender differences in the acceptance of home production as an alternative to market production (see e.g. Killingsworth and Heckman, 1986) are crucial drivers of differences in the importance of these social norms between men and women (see e.g. Bertrand *et al.*, 2015; Knabe *et al.*, 2016; Charles *et al.*, 2018). Thus, non-pecuniary incentives to work through prevalent social norms are likely to be crucial especially when explaining gender differences in labor force participation as well as long-term trends in female participation decisions. Nevertheless, a lot of unexplained heterogeneity in the decision making between women remains. Consequently, especially the most recent literature started to investigate the role of inherent personal attributes for female decision making on the labor market. Wichert and Pohlmeier (2010) find that e.g. the Big-Five personality traits play a significant role in explaining women’s labor supply. Although they also consider indirect effects through wage-differences, they conclude that the traits conscientiousness, extraversion, neuroticism and openness have a crucial direct behavioral effect on participation decisions.

A second important strand of literature this paper contributes to is the emerging research linking individuals’ personality to their behavior on the labor market. Especially locus of control has already been shown to have a tremendous positive effect on “desirable” behavior and decision making on the labor market in such areas as human capital investment (Coleman and DeLeire, 2003), job search effort (McGee and McGee, 2016; Caliendo *et al.*, 2015b), occupational attainment (Heywood *et al.*, 2017; Cobb-Clark and Tan, 2011), entrepreneurial activity (Caliendo *et al.*, 2014) and labor market mobility (Caliendo *et al.*, 2015a). Nevertheless, literature that directly relates female labor force participation to locus of control is scarce. Most prominently, Heckman *et al.* (2006) find a significant positive effect of a combined measure of locus of control and self-esteem on the individual probability of being employed at age 30 for the sample of young individuals from the NLSY79. They show that this relationship is much more pronounced for females. In a more recent study, Berger and Haywood (2016) analyze the effect of locus of control on mothers’s return to employment after parental leave. Using German survey data, they find that women with an internal locus of control return to employment more quickly. Based on a heterogeneity analysis with respect to the underlying flexibility in the women’s occupations, they conclude that the effect is mainly driven by different subjective

⁴ The main message of this literature is straightforward: individual identity influences economic outcomes since deviating from socially desirable behavior is costly for the individual (see e.g. Clark, 2003; Schöb, 2013; Hetschko *et al.*, 2014).

expectations about future career costs of maternity leave. That study is most closely related to the paper at hand. Nevertheless, it concentrates on a very specific group of women in a rather exceptional stage of life whereas this paper is intended to draw a much more general picture.

3 Theoretical Considerations

3.1 Basic Model of Female Labor Supply

In order to discuss and formalize the potential mechanisms through which locus of control might affect participation decisions of women, an one-period model of discrete labor supply decisions is considered as the baseline in the following (see e.g. McFadden, 1974; Borghans *et al.*, 2008; Almlund *et al.*, 2011). A woman’s within-period discrete participation choice is based on the maximization of the following utility function:

$$U_i = U_i(C_i, L_i, H_i, P_i; \theta_i) \tag{1}$$

with U being the neoclassical utility function of woman i , which maps her preferences. U is convex, i.e. increasing in its arguments and twice differentiable ($U' > 0$ and $U'' < 0$). C_i is the consumption level and L_i is leisure. As an extension to the traditional labor supply model such as e.g. in McFadden (1974), two new arguments are added to the utility function. Firstly, H_i captures all sorts of non-market (home) production such as in specific childcare. Hence, childcare is also allowed to generate a positive utility for woman i . A woman i thus divides her total amount of time T between leisure, market- and home production. Secondly, P_i captures the “joy of working”, i.e. the non-monetary benefits from working, independent from disutility of every hours worked (which is inversely captured by L). Similar to the argumentation in Cobb-Clark *et al.* (2014)⁵, P_i is based on the fact that woman might not only derive direct utility from the consumption level but also from the behavior they undertake to generate it. Consequently, utility not only depends on consumption as the monetary outcome of participation but also is a function of participation itself, independent from how large its effect on consumption levels might be.

In line with Borghans *et al.* (2011) and Almlund *et al.* (2011), the marginal gains from all arguments depend on a vector of individual attributes θ_i . Hence, as opposed to the standard decision making model, the preferences are heterogeneous. Based on the expansion of the traditional choice model, which allows for non-stochastic personal attributes θ_i instead of stochastic idiosyncratic shocks (McFadden, 1974), the potential role of locus of control for explaining in-

⁵ Cobb-Clark *et al.* (2014) argue that investments into health can have direct effects on individual utility independent from their outcomes simply through the act of investing which might generate positive utility by itself.

dividual differences can be discussed. For simplification, the vector θ_i is reduced to the one parameter locus of control by holding all other attributes constant. For intuition, two groups of women can be defined: Internal women (I) with the vector θ_I and external women (E) with the vector θ_E . In line with its later construction, we assume θ_i to increase with internality, i.e. $\theta_I > \theta_E$.

Woman i chooses the labor force status, which maximizes her utility and fulfills her budget constraint

$$y_i + \tilde{w}_i(T - L_i - H_i) \geq C_i + p_h(T - H_i) \quad (2)$$

The non-labor income y_i summarizes all sources of income which are not generated by the woman participating in the labor market such as partner's earnings and capital income. w_i is the potential wage rate of the woman if she decides to supply a positive amount of labor to the market, i.e. $T - L_i - H_i > 0$, with T being the endowment of time. The woman is not expected to have perfect information. Thus, \tilde{w}_i captures the expectations about the potential wage rate and is a subjective measure, which again depends on individual attributes: $\tilde{w}_i(\theta_i)$. The price of the aggregated consumption good is normalized to 1 and p_h is the hourly price for childcare and housework which is not provided by the woman ($T - H_i$). $T - H_i$ could either be provided externally or by the partner in the household. Consequently, for simplification, p_h is assumed to capture the costs of external housework or childcare as well as the hourly wage of the husband. Woman i chooses the optimal labor force status LF_i^* which maximizes her utility with the choice set B_i being either participating ($LF_i = 1$) if $T - L_i - H_i > 0$ or not participating ($LF_i = 0$) if $T - L_i - H_i = 0$ at the extensive margin:

$$LF_i^* = \operatorname{argmax}_{LF_i \in B_i} \{U_i\} \quad \text{with } B_i = \{0, 1\}. \quad (3)$$

As the focus of this paper is to analyze the behavioral aspects of labor force participation, while leaving the demand side aside, I concentrate on labor force availability as opposed to actual employment, in the following. This reduces the risk of biased results due to omitted returns in employment probability in the empirical part.⁶ In line with the ILO definition of "labor force", a woman is thus assumed to participate in the labor market if she is either already employed or self-employed or if she is unemployed and intends to participate by indicating that she is searching for a job (see International Labour Organization, 2018). Thus, LF_i also equals one if the woman does not work but is available to the market by searching for a job. In this simplification, given a certain expected market wage w_i , no assumptions on labor market conditions and frictions

⁶ Nevertheless, also the employment probability at the extensive and intensive margin is considered as an alternative outcome variable in a later stage.

are necessary, as LF_i^* only depends on the woman’s individual decision making processes and not on her exogenous probability of finding a job, except indirectly through her expectations captured by \tilde{w}_i . In line with this, conditional transfer payments which are paid in response to, for example, job search efforts, such as unemployment insurance to woman i , are also captured by w_i .⁷ Thus, w_i can be labeled as the “earnings from participation”.

3.2 Locus of Control and Potential Mechanisms

Based on this underlying model and the definition of locus of control, multiple hypotheses can be formed about the relationship between LOC (θ_i) and female labor force participation. These hypotheses will then guide the empirical analysis in Sections 4 and 5.

Mechanism 1 - Preferences The first potential channel suggests that LOC might affect a woman’s preferences for the different components of the utility function and thus the marginal utility she derives from participation. Nevertheless, two conflicting hypotheses can be proposed based on this mechanism. In the framework outlined above, woman might not only derive utility from the consumption level but also directly from participation in the labor market as the behavior they undertake in order to generate this level, i.e. P_i as a non-monetary incentive for participation. In line with the argumentation in Cobb-Clark *et al.* (2014), internal women are likely to have a higher preference for being active in the labor market than external women. Thus, they derive more additional direct utility from participation than do externals

$$\frac{\partial^2 U_i}{\partial P_i \partial \theta_i} > 0. \tag{4}$$

As a psychological reasoning for this, it can be argued that internals prefer to directly affect their life’s outcomes and thus be independent from external forces. They are more resistant to external influences and make more independent judgements. (Lefcourt, 1982) The role of independence considerations for locus of control has already been discussed especially in the context of early childhood skill formation in the psychological literature. (see e.g. Wichern and Nowicki, 1976; Hill, 2011) Thus, consumption which is generated based on self-earned income is valued higher than consumption based on external income such as partner’s earnings or unconditional social transfers. Based on these theoretical considerations, internal woman are ex

⁷ This assumption might be overly rigorous as welfare fraud is an ongoing political issue and important topic of the workfare literature. Individuals can abuse social benefits by pretending to search although they might not be willing to work anyways. Discussing this issue in detail is beyond the scope of this paper. Nevertheless, active search and availability to work will be an essential part of the definition of labor force participation in the empirical analysis instead of just relying on reported labor force status in order to identify truly involuntary unemployment. The interested reader may refer to the political literature which discusses welfare fraud as an important topic. (see e.g. Roosma *et al.*, 2016) Additionally, see e.g. Kreiner and Tranæs (2005) for a discussion of the role of workfare for the separation of voluntary and involuntary unemployment in general.

ante expected to be more likely to participate if P_i is increasing with participation.

As opposed to this, in the presence of children in the household, internal women might consider the effect of their own actions on their children more carefully than external women. This is in line with the findings by Lekfuangfu *et al.* (2018) on the strong effect of maternal LOC on attitudes towards parental style as well as actual parental time investments. Thus internal mothers might have stronger preferences for home production as they gain higher utility from every unit of H_i :

$$\frac{\partial^2 U_i}{\partial H_i \partial \theta_i} > 0. \quad (5)$$

If a mother assumes that her efforts in child-rearing has important positive effects on her children's outcomes, she is also more likely to stay at home with young children as opposed to putting them into childcare. This channel would ex ante be associated with a negative effect of LOC on participation probabilities in the presence of children in the household as H_i is decreasing with participation.

Mechanism 2 - Budget Constraints The second proposed channel suggests that LOC might directly affect a woman's subjective and objective budget constraints. Firstly, women might differ with respect to their expected monetary returns to participation driven by differences in the subjective expectations about returns to investments. The expected monetary returns to participation are higher for internal individuals as they believe in the direct causality between their own efforts and life's outcomes. Internal women, for example, have higher subjective job-offer arrival rates (Caliendo *et al.*, 2015b), higher appreciation of future career costs of non-working (Berger and Haywood, 2016) and higher subjective wage rates. Hence, they expect higher earnings from participation, i.e. $\partial \tilde{w}_i / \partial \theta > 0$, and thus gain higher utility from availability for market production as their budget constraints allows for higher returns to participation in expected consumption levels \tilde{C}_i :

$$\frac{\partial U_i}{\partial \theta_i} = \frac{\partial U_i}{\partial \tilde{C}_i} \times \frac{\partial \tilde{C}_i}{\partial \theta_i} > 0. \quad (6)$$

Nevertheless, the difference between internal and external women could also be driven by differences in the objective monetary returns to locus of control and thus indirectly via different constraints rather than through direct behavioral effects. One potential explanation for this may be positive demand-side responses to an internal LOC, i.e. higher realized wage rates (see e.g. Heineck and Anger, 2010) which are correctly anticipated by women and thus incorporated into the decision-making independent from the subjective beliefs discussed above. Additionally, internal women have been found to select occupations that are less open for flexible employ-

ment paths, i.e. leaving and returning to employment, such as science, engineering or related professions (Cobb-Clark and Tan, 2011). These occupations are likely to be associated with higher future career costs of non-participation and thus higher disincentives for home production through reduced future wages and employment probabilities. Thus not only \tilde{w}_i but also w_i itself depends on θ_i .

Secondly, LOC might also be correlated with the partners' earnings driven by assortative mating or mating probabilities in general. Lundberg (2012) for example shows that personality traits have an important effect on the formation and stability of marriage. In the present case, it may be the case that internal women tend to marry men with higher or lower earnings or even tend to be less or more likely to marry at all, which would again affect their own participation probabilities through y_i . It is also possible that assortative mating is important with respect to the personality of the partner. Women with an internal LOC might be more likely to mate with men with an internal LOC, which again indirectly influences women's participation decisions through their partners' earnings. Hence, internal women might differ with respect to their available family income and thus have a higher or lower necessity to work in order to achieve their desired consumption level. Nevertheless, these indirect effects of LOC on participation probabilities via different budget constraints can be largely controlled for in the empirical analysis in Section 6.1.

3.3 Effect Heterogeneity

The influence of personality on participation via preferences and beliefs can be assumed to crucially depend on the overall size of underlying incentives. If monetary and non-monetary incentives for market or home production are very high, the power of personality to affect participation probabilities may be comparably low. Thus, the estimated effects are expected to be highly heterogeneous with respect to the overall size of e.g. y_i and H_i , which are determined by the existence of partners and children in the household as well as the amount of non-labor income such as partners earnings. Partners earnings and thus the level of family income have already been found to be negatively associated with female participation probabilities (Ashenfelter and Heckman, 1974; Lundberg, 1988; Devereux, 2004). A single woman without any other external income sources ($y_i = 0$) thus has to fulfill all her basic consumption needs with her own market earnings or conditional transfer payments. If $w_i - p_h$ is assumed to be non-negative⁸, the woman has to generate a certain level of $w_i(T - L_i - H_i)$ and thus $(T - L_i - H_i) > 0$. If we assume no welfare fraud taking place, this woman will certainly participate in the labor market since basic

⁸ For the specific case of Germany, this assumption is reasonable as childcare costs are relatively low.

welfare benefits follow the workfare principle and are thus conditional on participation.⁹ As this considerably constraints her free choice between market and home production, the power of θ_i to affect LF_i^* is expected to be very low.¹⁰

Also the existence of children might interact with the effect of LOC on participation probabilities because the presence of children is likely to significantly increase the monetary and non-monetary utility from home production H_i and has thus been found to significantly reduce labor force participation of women (see. e.g. Angrist and Evans, 1998; Bronars and Grogger, 1994). If no children are present in the household, the utility from home production may be too low and home production might thus be a less attractive outside option from market production. LOC is therefore expected to affect the participation probabilities of women with (non-adult) children more strongly. On the other hand, the existence of (young) children could also lead to very high non-monetary incentives for home production, depending on a woman’s parenting preferences, age of the children and the quality and costs of childcare options, and thus again reduce the power of LOC.

As a third heterogeneity consideration, the population-wide or sub-group specific amount of non-monetary utility from participation, captured by $\partial U_i / \partial P_i$, is likely to be important. If the part of the marginal effect which reflects social norms for working, is already very high, even women who individually gain lower marginal utility from participation (i.e. external women) still have a high probability of participating as the marginal utility from participation is already considerably high:

$$\left(\frac{\partial U_i}{\partial P_i}\right)_1 > \left(\frac{\partial U_i}{\partial P_i}\right)_2 \tag{7}$$

$$\left(\frac{\partial^2 U_i}{\partial P_i \partial \theta_i}\right)_1 < \left(\frac{\partial^2 U_i}{\partial P_i \partial \theta_i}\right)_2 \tag{8}$$

with (1) being the group of women which is exposed to high social norms for working and (2) being the group of women which is exposed to low social norms of working (see e.g. Jahoda, 1981; Clark, 2003; Hetschko *et al.*, 2014). This is also in line with the idea that, for example, for men the social norms of “earning your own living” or “being the breadwinner” are expected to be very high in general independent from their LOC (see e.g. Killingsworth and Heckman, 1986; Bertrand *et al.*, 2015; Knabe *et al.*, 2016; Charles *et al.*, 2018). The same might be true for

⁹ Adults who receive social transfer payments in Germany are in general required to be available for any reasonable employment if they are employable (§7 SGB II). Unemployment insurance payments are thus directly bound to an active job search requirement.

¹⁰ This consideration can be slightly softened for single mothers with young children in Germany. In German law, employment is, amongst others, not “reasonable” if this employment would, for example, endanger the upbringing of children. As is regulated in §10 SGB II, this applies to children under the age of 3. Thus for these women, unemployment insurance payments can be assumed to be captured by y_i as long as no other sources of income exist.

groups of women who are subject to very high social norms of working. For them the harm from staying at home exceeds the gains from participation independent from their personal attributes θ_i . Within the analysed population in the empirical part of the paper, variation in social norms is expected to be captured by regional differences as well as cohort and time trends.

4 Data and Empirical Identification

On the basis of these theoretical considerations, the goal of this paper is to empirically analyze the role of locus of control in explaining women’s current labor force participation. This is done by using data from the German Socio-Economic Panel (SOEP, 2017). The SOEP is an annual representative household panel that follows a general-purpose approach. It has been studying about 22,000 individuals living in 12,000 households in Germany since 1984. Personal questionnaires are completed by all individuals aged 18 or older. For more information on the SOEP see Goebel *et al.* (2018). It contains a measurement of locus of control over multiple waves, rich information on current labor-market outcomes and family status as well as the opportunity to connect women to regional information as well as their partners’ characteristics if they are surveyed in the same household. The data is restricted to the waves 2000-2015 due to the measurement of locus of control as well as the availability of the regional information.

Sample Restriction For the sample restriction process, I only keep women in the traditional working age, which is defined as 25 to 65 years. As another restriction, all women who are still in school, academic or vocational education, already in (early) retirement or in military service are dropped. Additionally, only women who live in single-adult or in couple households with or without children are kept. All women in multi-generation households or other unknown household combinations are dropped. Finally, only women for whom it is possible to observe all the relevant socio-economic control variables are kept. This leaves 57,308 observations for 7,724 women over 15 years in the full sample of all women.

Table A.1 in the Appendix gives an overview of the descriptive statistics of the full sample (column 1). In addition to the full sample of all women, the descriptive statistics are also reported for three (non-exclusive) subsamples: (1) all women with biological children under 16¹¹ (2) non-cohabiting women, i.e. single women or women with a partner outside their household, and (3) cohabiting women, i.e. married women or women with a partner in the same household.

¹¹ The sample includes all women independent of their family status. The information on the children is generated on the basis of the individual birth history of the women available from the SOEP. The sample thus includes all women who have children under the age of 16 (independent of whether they live in the same household).

Table 1: Descriptive Statistics - Labor Force Status

	(1) All <i>mean</i>	(2) Children under 16 <i>mean</i>	(3) Not Cohabiting <i>mean</i>	(4) Cohabiting <i>mean</i>
Labor Force Status				
Employed	0.70	0.62	0.77	0.69
Full-Time (≥ 35 hours)	0.54	0.35	0.68	0.50
Part-Time (15 - 34 hours)	0.37	0.51	0.28	0.40
Marginal (< 15 hours)	0.09	0.15	0.04	0.11
Self-Employed	0.07	0.07	0.12	0.05
Unemployed	0.06	0.06	0.07	0.06
Not-Working	0.13	0.15	0.03	0.16
Maternity Leave	0.04	0.10	0.01	0.04
Outcome: Labor Force Participation	0.82	0.74	0.93	0.79
Observations	57,308	22,219	11,267	46,041
Individuals	7,724	3,617	2,305	6,565

Source: SOEP, waves 2000 - 2016, version 33, own calculations.

Note: Full descriptive statistics can be found in Table A.1 in the Appendix.

4.1 Labor Force Participation

Labor force participation (LF) is measured as a binary indicator that indicates a woman's availability to the labor market. The focus of this paper is to analyze the behavioral aspects of labor supply. Thus, labor force participation does not describe a woman's true labor force status but her willingness to participate in market production. Concentrating on the availability to the job market rather than on the actual employment status allows the demand side to be theoretically and empirically neglected and the risk of selection effects via differences in employment probabilities to be reduced.

In line with the ILO definition of labor force participation, a woman is counted as being in the labor force if she is either employed or self-employed or if she is registered unemployed or non-working (not registered unemployed) but intends to work and is searching for a job (see International Labour Organization, 2018)¹². The robustness of the results with respect to the definition of the dependent variable is tested and discussed in detail in a sensitivity check in Section 5.4. For this purpose an indicator for labor force activity (employment), indicators for differences at the intensive margin (e.g. full-time employment) as well as cumulative time in the labor force during the core working age are used as alternative outcome variables.

Table 1 gives an overview of the current labor force status of the women. In the full sample of

¹² Registered unemployed and non-working women are recoded on the basis of the information available on intention to work, active search and ability to start working from the personal questionnaire. Registered unemployed women who indicate that they were not actively searching for work in the last 4 weeks are coded to "not participating" while women who were originally coded as "not working" but indicate that they actively searched for a job, have the unconstrained intention to work and are ready to immediately start working are coded to "participating".

Table 2: Components of Locus of Control (not imputed)

No	Item	mean	SD
Q:	The following statements apply to different attitudes towards life and the future. To what degree do you personally agree with the following statements? Scale: 1 (Disagree completely) - 7 (Agree completely)		
I1:	How my life goes depends on me	5.46	(1.39)
I2:	Compared to other people, I have not achieved what I deserve (-)	3.15	(1.76)
I3:	What a person achieves in life is above all a question of fate or luck (-)	3.53	(1.63)
I4:	If a person is socially [...] active, she can have an effect on social conditions	3.71	(1.58)
I5:	I have the experience that others have a controlling influence over my life (-)	3.11	(1.66)
I6:	One has to work hard in order to succeed	5.91	(1.14)
I7:	If I run up against difficulties in life, I often doubt my own abilities (-)	3.49	(1.66)
I8:	The opportunities that I have in life are determined by the social conditions (-)	4.54	(1.43)
I9:	Inborn abilities are more important than any efforts one can make	4.78	(1.31)
I10:	I have little control over the things that happen in my life (-)	2.63	(1.47)
	Observations	14,214 ^a	

Source: SOEP, waves 1999, 2005, 2010 and 2015, version 33, doi:10.5684/soep.v33.

Notes: Items marked with a (-) are reversed prior to factor analysis.

^a In this table, the item means and SD are computed for the observation waves 1999,2005, 2010 and 2015 only. Imputed values are not included.

all women (column 1), 70% are employed, 7% are self-employed, 6% are unemployed and in total 17% indicate that they are not working or on maternity leave. If, in addition to these raw shares, the information on active job search, intention to work and availability to start working are also considered, a labor force participation rate of 82% results. Due to a lower share of employed women and a higher share of women who indicate that they are not working in the subsample of cohabiting women (column 4) as compared to the subsample of non-cohabiting women (column 3), the labor force participation is distinctively lower for the former (79% compared to 93%). The same holds true for all women with children under the age of 16 (column 2).

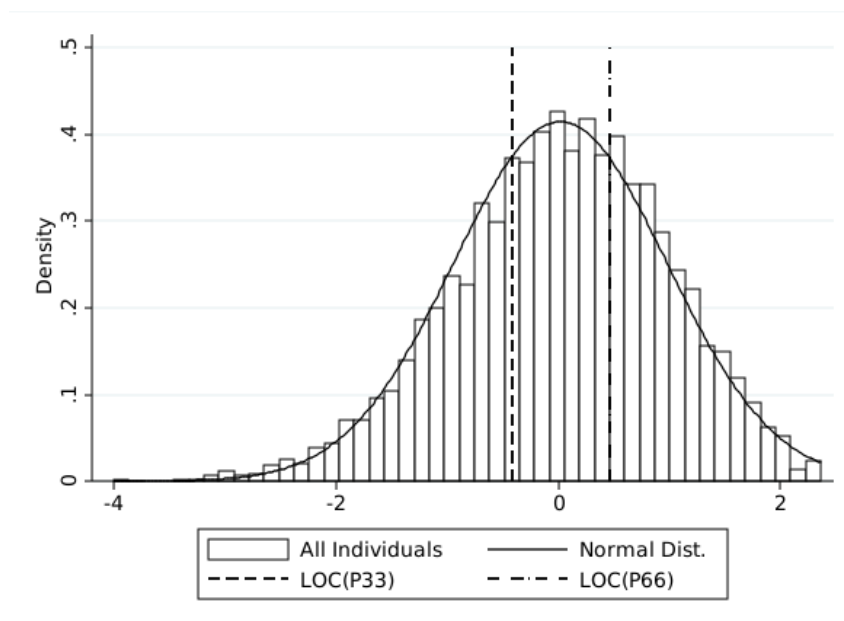
4.2 Locus of Control

Locus of Control is surveyed within the SOEP in the years 1999, 2005, 2010 and 2015. Based on a scale developed by Nolte *et al.* (1997), respondents were asked how closely a series of 10 statements characterizes their views about the extent to which they influence what happens in life. A four-point Likert scale ranging from 1 ('applies fully') to 4 ('does not apply') was used in 1999, while in 2005, 2010 and 2015 responses were measured on a seven-point Likert scale ranging from 1 ('disagree completely') to 7 ('agree completely'). A list of the items can be found in Table 2.

In order to harmonize the scales, the responses from 1999 are reversed and "stretched".¹³ Afterwards, an exploratory factor analysis is conducted separately by year in order to investigate

¹³ In line with Specht *et al.* (2013), this process preserves the standard deviation, but allows for changes in the mean. The process results in values of 1, 3, 5 or 7 such that a '1' on the 1999 four-point scale, for example, becomes a '7' on the 2005-2015 seven-point scales.

Figure 1: Distribution of Locus of Control



Source: SOEP, waves 1999, 2005, 2010 and 2015, version 33, doi:10.5684/soep.v33, own illustration.

the way these items load onto latent factors.¹⁴ Items 1 and 6 clearly load onto the first factor – which is interpreted as internal LOC –, while items 2, 3, 5, 7, 8 and 10 clearly load onto the second factor – interpreted as external LOC. Items 4 and 9 are not included in the following due to ambiguous loading¹⁵. Additionally, similar to the reasoning in Specht *et al.* (2013), excluding those two items improves the internal consistency and scale reliability of the resulting factor as Cronbach’s alpha (Cronbach, 1951) increases from 0.62 to 0.67.

In line with the previous literature (see e.g. Piatek and Pinger, 2016), a two-step procedure is used in order to create a continuous and unidimensional LOC factor. First, the scores for items 2, 3, 5, 7, 8 and 10 are reversed such that all eight items are increasing in internality.¹⁶ Second, confirmatory factor analysis is used to extract a single factor for each year. This has the advantage that it avoids simply weighting each item equally, as averaging would do, and instead allows the data to determine how each item is weighted in the overall index. Simple averaging of all items would risk measurement error and attenuation bias (Piatek and Pinger, 2016).¹⁷ The resulting factor is increasing in internal LOC and its distribution is shown in Figure 1.

On the basis of the generated and imputed continuous LOC factor variable, I create a categorical variable that splits the continuous LOC in three terciles, in order to identify non-linear

¹⁴ The detailed results from the factor analysis are available upon request. A loading plot pooled for all years can be found in Figure A.1 in the Appendix but the pattern of factor loadings is similar in all years.

¹⁵ Item 4 does not clearly load onto either of the two factors and is discarded. Item 9 loads onto the internal factor but an intuitive attribution based on the item’s wording would point more in the direction of an external item.

¹⁶ These items are marked with a (-) in Table 2.

¹⁷ The sensitivity checks in Section 6.2 include a re-estimation of the results using this simple index. The results do only marginally differ.

relationships. These cutoffs are also illustrated in Figure 1.

There is evidence that LOC is relatively stable for the working-age population (see e.g. Preuss and Hennecke, 2018; Cobb-Clark and Schurer, 2013). Nevertheless, in order to minimize concerns about potential reverse causality, I ensure that the LOC factor is always included as a pre-market rather than a contemporaneous or post-market measure, i.e. always obtained prior to t , in line with the argumentation in Piatek and Pinger (2016). Hence, LOC is imputed forwards lagged by at least one year. That is, LFP in 2000 - 2005 depends on the 1999 locus of control, LFP in 2006 - 2010 depends on the 2005 locus of control and LFP in 2011 - 2015 depends on the 2010 locus of control.¹⁸

4.3 Estimation Strategy

For the main empirical analysis, I employ a reduced-form approach to estimate the association between a woman’s propensity to be available to the labor force and her last LOC:

$$P(LF_{it} = 1) = P(\beta_1 + \beta_2 loc_{it-n} + \beta_3 X_{it} + \beta_4 P_i + \beta_5 R_{it} + \beta_6 T + \epsilon_{it} > 0), \quad (9)$$

where LF_{it} is the indicator for labor force participation of woman i at time t and loc_{it-n} is the locus of control of woman i in the last LOC interview prior to t , i.e. n interviews prior to t with $n = \{1, \dots, 6\}$. In order to identify potential non-linearities in the relationship, the analysis is repeated with a categorical variable that indicates in which tercile of the LOC distribution a woman is classified. The vector X_{it} contains an extensive list of demographic information (age, religion, region of residence, school and vocational degree, subjective health) and family characteristics (partner status, number of children, indicators for children in certain age ranges). Additionally, family income is approximated by subtracting the reported labor net income as well as individual unemployment insurance payments from the reported net household income. The variable is thus assumed to capture all earnings which are not generated through labor force participation of woman i . It includes partners earnings as well as all other regular income sources such as unconditional social transfer payments.¹⁹ It is contains as a dichotomous indicator for a low, medium or high family income. Additionally, averaged and standardized personality and

¹⁸ Based on the findings in Preuss and Hennecke (2018), this procedure does not prevent a bias due to a temporary measurement error in LOC during periods of unemployment. In line with what is proposed in Preuss and Hennecke (2018), I thus additionally attempt to correct the LOC measurement by using the LOC which has been observed during the closest employment spell of these women. The results of these estimations are presented and discussed in Section 6.2. As an additional sensitivity check also the average over all available LOC observations is used as an explanatory variable.

¹⁹ Only earnings-related unemployment insurance benefit, the so called “Arbeitslosengeld I” are subtracted. Unemployment benefits as part of the basic income scheme for needy jobseeker, the so called “Arbeitslosengeld II”, cannot be distinguished from other social assistance payments within the household and is thus still captured within the variable although it still follows the principle of activity. See e.g. Konle-Seidl *et al.* (2007) for an overview over the unemployment benefits system in Germany.

preferences measures P_i (Big Five personality traits and risk aversion) are included as controls.²⁰

The vector R_{it} contains a list of regional information corresponding to the local planning region (“Raumordnungsregion”)²¹ in which the woman lives at time t . The information is available from the INKAR data provided by the German Federal Institute for Research on Building, Urban Affairs and Spatial (BBSR, 2015). The vector includes an indicator for East-Germany, the unemployment rate, the gross value added, the population density, the median full-time income of women, the share of children in public childcare for the age groups 1-3 years and 3-6 years as well as the share of full-time (> 7 hours per day) childcare in the respective age-groups. Additionally, the median costs for full-time childcare per child are approximated based on the information available from all SOEP respondents in the respective region.²² See Table A.1 for the full list of controls. Finally, the vector T contains year fixed effects.

Equation 9 is estimated using a random effects logit model. Hence, ϵ_{it} captures the idiosyncratic error as well as the random individual-specific effect which is assumed to be uncorrelated with the explanatory variables. The use of random effects is necessary as it considers the panel structure of the data and takes care of serial correlation of the error term ϵ_{it} across time for a given individual i . The results presented in Section 5 are the average marginal effects on the probability of a positive outcome assuming that the random effect is zero.²³

As already discussed in the theoretical considerations, the estimated direct relationship is very likely to be non-linear with respect to monetary and non-monetary incentives as important decision constraints. Consequently, heterogeneity with respect to the family status (i.e. existence of a partner and children in the household) and the level of family income as well as with respect to underlying differences in social norms of working (i.e. region of living, cohort indicators and period indicators) is considered in a second step. Since not only β_2 , i.e. the marginal effect of *loc*, is regarded to be non-linear, the heterogeneity is examined using fully separated models for

²⁰ In a sensitivity check in Section 6, I additionally investigate the role of characteristics of the employment type in the current or last employment spell in order to assess the importance of selection in certain industries or occupational types. Nevertheless, these variables are assumed to be “bad controls” in the estimation due to the high risk of endogeneity of those variables in the model (see Angrist and Pischke, 2008, for more information). See a more detailed discussion of the problem in Section 6.

²¹ The households residential location is classified into one of 96 separate regions using the SOEP geocodes. Although these regions do not correspond to official local government areas, they are the basis for the federal German government’s regional planning. In particular, they capture urban centers (along with their associated catchment areas) and are defined on the basis of commuting flows (see BBSR, 2015).

²² In the years 2002, 2005, 2007, 2011, 2013 and 2015 households report detailed information on the childcare costs per child in the household as well as information on the type and amount of childcare. Based on all households with a child in full-time public childcare (> 7 hours) in the region, the median over all reported amounts is calculated.

²³ In order to assess the sensitivity of the results with respect to the choice of method, the main results were replicated using a simple logit model with clustered standard errors and a random effects linear probability model. The estimated results of both alternatives only marginally differ from the random effects logit estimation in effect size and are available from the author upon request.

Table 3: Descriptive Statistics by LOC - Labor Force Status

	Low LOC [LOC_{min}, LOC_{P33}]	Medium LOC (LOC_{P33}, LOC_{P66}]	High LOC (LOC_{P66}, LOC_{max}]
Labor Force Status			
Employed	0.67	0.72	0.72
Full-Time Employed	0.53	0.53	0.55
Part-Time Employed	0.47	0.47	0.45
Self-Employed	0.10	0.06	0.04
Unemployed	0.04	0.06	0.08
Not-Working	0.16	0.12	0.11
Maternity Leave	0.03	0.04	0.04
Outcome: Labor Force Participation	0.78	0.82	0.84
Observations	18,912	18,917	19,479

Source: SOEP, waves 2000 - 2016, version 33, doi:10.5684/soep.v33, own calculations.

the different subgroups SG_{it} :

$$P(LF_{it} = 1 | SG_{it}) = P(\beta_1 + \beta_2 loc_{it-1} + \beta_3 X_{it} + \beta_4 P_i + \beta_5 R_i + \beta_6 T + \epsilon_{it} | SG_{it}). \quad (10)$$

In order to prevent problems with selection into these sub-groups depending on locus of control, the LOC is generated, standardized and cut into terciles for each sub-group separately such that women are always only compared to women in the same sub-group. All results from the heterogeneity analysis were also replicated using interactions instead of the fully separated models. The results differ only marginally and can be obtained from the author upon request.

5 Results

5.1 Descriptive Evidence

Table 3 gives first descriptive evidence for the relationship between LOC and labor force status and participation of the women in the sample. The shares of all labor force statuses as well as the dependent variable labor force participation are given separately for all three terciles of LOC. It can be seen that due to a higher share of employed and unemployed women and a lower share of non-working women for the highest tercile, the overall share of labor force participation is higher for women with a high LOC than for those with a low LOC. As opposed to the expectations, the share of self-employed women decreases with increasing LOC which slightly counteracts the overall picture. Nevertheless, this descriptive relationship is very likely to be driven by a long list of socio-demographic characteristics that are associated with a higher participation probability and a higher LOC, such as education, age and family status (e.g. number and age of children).

Table 4: Main Results - Average Marginal Effects (Sample: All)

	Outcome Variable: Labor Force Participation							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LOC Factor (cont.)	0.006*** (0.001)		0.004*** (0.001)		0.010*** (0.002)		0.008*** (0.002)	
Locus of Control Terciles (Ref.: [LOC_{min} , LOC_{P33}])								
(LOC_{P33} , LOC_{P66})		0.009*** (0.002)		0.009*** (0.003)		0.015*** (0.003)		0.013*** (0.003)
(LOC_{P66} , LOC_{max})		0.012*** (0.002)		0.009*** (0.003)		0.019*** (0.004)		0.014*** (0.004)
Observations	57,308	57,308	57,308	57,308	57,308	57,308	57,308	57,308
Year Fixed-Effects	✓	✓	✓	✓	✓	✓	✓	✓
Regional Controls	✓	✓	✓	✓	✓	✓	✓	✓
Socio-Demographic Controls			✓	✓	✓	✓	✓	✓
Family Controls					✓	✓	✓	✓
Personality Controls							✓	✓

Source: SOEP, waves 2000 - 2016, version 33, doi:10.5684/soep.v33, own calculations.

Notes: Standard Errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Full estimation results for the specification in column (7) can be found in Table A.2 in the Appendix.

5.2 Main Results

Table 4 presents an overview of the estimated average marginal effects of the continuous LOC variable and the LOC categories medium ((LOC_{P33}, LOC_{P66})) and high ((LOC_{P66}, LOC_{max})) on labor force participation, with a low LOC ($[LOC_{min}, LOC_{P33}]$) being the reference category. All the estimations are for the full estimation samples of all women, while gradually including more and more sets of control variables. In addition, column 1 of Table A.2 in the Appendix provides an overview of the estimated marginal effects for all the control variables analogous to the estimation using the continuous LOC variable (columns 7 in Table 4).

In line with the descriptive evidence in the previous subsection, the results of the raw difference, only controlled for year fixed effects, indicate that on average women with a high or medium LOC are ceteris paribus more likely to participate in the labor force (see column 2). Furthermore, the continuous LOC factor is significantly positive, indicating an increasing probability of participation with increasing values of LOC (column 1). Including additional control variables indicates that the raw gap was biased downwards by omitted-variable bias especially through family characteristics. The effect size increases considerably between between columns 3 (4) and 5 (6), when partner status, number of children, age of children and family income are included. Thus, in the full specification (columns 7 and 8), the average marginal effect is significantly positive and even more pronounced as in the raw difference. Having a medium or a high LOC increases the probability of being in the labor force by, on average, 1.3 and 1.4 percentage points compared to having a low LOC. When comparing this effect to the mean

non-participation rate in the full sample of 18 percent (see Table 1), this amounts to a 7.8 percent decrease in the probability of staying at home. Increasing the LOC by approximately one standard deviation, increases the probability of participation by 0.8 percentage points (column 7).

When comparing the marginal effects of a medium and a high LOC, a non-linearity in the effect of LOC on the participation probability becomes apparent. While a medium LOC is associated with an increased probability of participation, this effect flattens out afterwards. Women with a very high LOC are not significantly more likely to participate than women with a medium LOC. In line with the one-dimensionality of the LOC scale, the findings indicate that the effect is mainly driven by a negative impact of being strongly external, rather than a positive impact of being strongly internal.

5.3 Heterogeneity Analysis

Family Status and Children Using these main results for the full sample, Table 5 presents the results for the sub-samples based on family status and existence of biological children under the age of 16. All estimations include the full specification and, for comparison, columns 1 of Table 5 give the results for the full sample (equivalent to column 8 in Table 4).²⁴ Fully separated estimations are reported. These subgroup analyses correspond to the supposed heterogeneity of the effect of LOC on participation probabilities with respect to underlying monetary and non-monetary incentives and disincentives to work driven by the existence of partners and children in the household.

Looking at the estimated average marginal effects for the separate groups, we can see that the effect is in large part driven by cohabiting women and women with children under 16 in general. Cohabiting women with a medium/high LOC are, on average, *ceteris paribus* 1.5 percentage points more likely to be in the labor force than cohabiting women with a low LOC (column 7). For non-cohabiting women, the effect is insignificant and close to zero²⁵. However, separating the two groups by the children-indicator shows that this difference is in large part driven by the existence of children in both groups. In the subgroup of women with children under 16, the effect for non-cohabiting women, i.e. single mothers, (column 6) is even higher than the effect for cohabiting women with children (column 9). Single mothers with a medium LOC are, on average, *ceteris paribus* 2.8 percentage points more likely to be in the labor force than single mothers with a low LOC. A high LOC increases the probability of being in the labor force by

²⁴ In addition, Table A.2 in the Appendix gives an overview of the estimated marginal effects for all the control variables corresponding to the estimations in columns 1, 3 and 7. The full results for all other models can be obtained from the author upon request.

²⁵ Similar insignificant close-to-zero effects can be found for men using the same sample specifications. The results can be obtained from the author upon request.

Table 5: Heterogeneity Analysis (Marginal Effects): Family Status and Children

	All			Non-Cohabiting			Cohabiting		
	Children under 16			Children under 16			Children under 16		
	All	No	Yes	All	No	Yes	All	No	Yes
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Locus of Control Terciles (Ref.: [LOC_{min} , LOC_{P33}])									
(LOC_{P33} , LOC_{P66}]	0.013*** (0.003)	0.007*** (0.002)	0.022*** (0.007)	0.001 (0.004)	-0.004 (0.002)	0.028** (0.014)	0.015*** (0.004)	0.013*** (0.003)	0.016** (0.008)
(LOC_{P66} , LOC_{max}]	0.014*** (0.004)	0.009*** (0.003)	0.022*** (0.008)	0.004 (0.004)	-0.001 (0.002)	0.023 (0.015)	0.015*** (0.005)	0.014*** (0.004)	0.015* (0.009)
Observations	57,308	35,089	22,219	11,267	8,404	2,863	46,041	26,685	19,356
LF = 0	10,526	4,688	5,838	822	380	442	9,704	4,308	5,396
LF = 1	46,782 (82%)	30,401 (87%)	16,381 (74%)	10,445 (93%)	8,024 (95%)	2,421 (85%)	36,337 (79%)	22,377 (84%)	13,960 (72%)
All Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓

Source: SOEP, waves 2000 - 2016, version 33, doi:10.5684/soep.v33, own calculations.

Notes: Standard Errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Full estimation results for the specifications in columns (1), (3) and (7) can be found in Table A.2 in the Appendix.

2.3 percentage points although not significant due to the small sample size. In the sub-sample of women without children, the effect is still positive and significant for cohabiting women (column 8) but zero for non-cohabiting women (column 5). Table A.3 in the Appendix also provides analog estimation results for mothers depending on the age of their children. Women with pre-school children exhibit the largest effects (column 3 of Table A.3). Having a high LOC on average decreases a woman’s non-participation probability by 6 percentage points (18%) if she has pre-school children. For mothers of babies especially the effect of a high LOC is close to zero. As opposed to this, the effect for women with “adult” children is still significant and positive.

All these results support the theoretical idea that the effect of LOC on participation probabilities strongly interacts with underlying incentives and disincentives to work. If the monetary incentives for market production, such as in the case of single women without children, already considerably exceed the decision threshold, personality and preferences have no power to affect the participation decision. The same holds true for very high monetary disincentives to work, e.g. in the sample of women with children under the age of one, i.e. women who are largely eligible for generous parental leave payments. Thus, very high monetary incentives and disincentives to work act in the same direction, i.e. they reduce the power of LOC.

Also in line with the theoretical considerations, a certain level of monetary and non-monetary incentives for home production impose the necessary scope of decision making that is important in order for LOC to change the decision towards working. This is, for example, given through the social purpose the existence of (young) children adds to home production. Being independent of monetary incentives, only women who at least consider home production as an outside

option to market production are assumed to be affected by their LOC. If no young children are present in the household, the utility from home production seems to be very low and home production is thus a less attractive outside option to market production – such as in the case of cohabiting women without children (column 8 in Table 5) or with school-age and adult children (columns 4 and 5 in Table A.3). Evaluating the theoretical ideas on the consequences of very high non-monetary incentives for home production, e.g. through the importance of care provided by the mother as opposed to outside-household childcare, is less straightforward as this is highly heterogeneous with respect to individual preferences about childcare and the quality of alternative childcare options. The theoretical idea that an internal LOC might be associated with a lower participation probability for mothers due to considerations about their own influence on children’s outcomes cannot be found in the results for participation probabilities in general. The effect of LOC on participation probabilities is robustly positive over all the subgroups considered. Merely the more pronounced non-linearity in the effects for mothers (especially single mothers) might be driven by this alternative mechanism.²⁶

Family Income As a more direct measure of differences in the monetary incentives to work, the approximated family income can be used for the definition of the sub-groups. Family income is intended to capture all non-labor income y available to a women in the household, e.g. partners labor income and unconditional social transfers. For a detailed description on the generation of this variable, see Section 4.3. The three sub-groups are generated based on whether the family income is low, medium or high with the terciles being the cut-offs. Table 6 presents the results of the heterogeneity analysis. All estimations include the full specification using the dichotomous LOC measure (equivalent to column 8 in Table 4). The sample of all women is used and fully separated estimations are reported.

The observation numbers and reported shares in the bottom panel of Table 6 show that women with a high family income are, in line with expectations, distinctly less likely to participate in the labor force (74%) as compared to women with a low family income (92%). The sub-group analysis reveals indication for the expected heterogeneity. While the marginal effects of a medium LOC are rather consistent, the effect of a high LOC seems to increase with increasing family income. While internal women with a low family income are on average only one percentage point more likely to participate, the participation probability for internal women with a high family income is on average 1.6 percentage points higher than for external women.

²⁶ The sensitivity check in Section 5.4 reveals remarkable differences at the intensive margin, showing that mothers with a medium LOC are actually less likely to work full-time. This is clear evidence for considerations about own children’s outcomes being at play when women decide about working hours.

Table 6: Heterogeneity Analysis: Family Income

	Family Income		
	Low	Medium	High
	(1)	(2)	(3)
Locus of Control Terciles (Ref.: [LOC_{min} , LOC_{P33}])			
(LOC_{P33} , LOC_{P66})	0.010*** (0.003)	0.012* (0.006)	0.010 (0.007)
(LOC_{P66} , LOC_{max})	0.010*** (0.003)	0.013* (0.007)	0.016** (0.007)
Observations	18,835	18,783	19,690
LF = 0	1,486	3,822	5,218
LF = 1	17,349 (92%)	14,961 (80%)	14,472 (74%)
All Controls	✓	✓	✓

Source: SOEP, waves 2000 - 2016, version 33, doi:10.5684/soep.v33, own calculations.
Notes: Standard Errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Heterogeneity Analysis: Social Working Norms (Sample: All)

	Region		Cohort ¹			Observation Period		
	West	East	Early < '58	Middle '58-'66	Late > '66	'99 - '05	'05 - '10	'10 - '15
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Locus of Control Terciles (Ref.: [LOC_{min} , LOC_{P33}])								
(LOC_{P33} , LOC_{P66})	0.016*** (0.005)	0.007* (0.004)	0.020*** (0.007)	0.008*** (0.003)	0.005 (0.006)	0.031*** (0.011)	0.008 (0.007)	0.005 (0.006)
(LOC_{P66} , LOC_{max})	0.021*** (0.005)	0.003 (0.004)	0.025*** (0.008)	0.004 (0.003)	0.016*** (0.006)	0.020* (0.012)	0.017*** (0.007)	0.016*** (0.006)
Observations	41,770	15,538	18,507	17,747	21049	16,619	23,000	21,049
LF = 0	8,871	1,655	3,959	2,327	4,240	3,782	4,131	2,613
LF = 1	32,899 (79%)	13,883 (90%)	14,553 (79%)	15,420 (87%)	16,809 (80%)	12,837 (77%)	18,869 (82%)	15,076 (85%)
All Controls	✓	✓	✓	✓	✓	✓	✓	✓

Source: SOEP, waves 2000 - 2016, version 33, doi:10.5684/soep.v33, own calculations.

Notes: Standard Errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

¹ Cohort Cutoffs: Early - born before 1958, Middle - born 1958-1966, Late - born after 1966.

Social Norms of Working In addition to budget constraints, a woman's decision making might also be constraint by prevailing social norms for working. If social norms for working are rather high (such as e.g. for men), decision making based on inherent preferences is considerably constraint. Table 7 presents the results of this heterogeneity analysis. All estimations include the full specification using the dichotomous LOC measure (equivalent to column 8 in Table 4). The sample of all women is used and fully separated estimations are reported.

Firstly, heterogeneity can be expected with respect to differences between the eastern and western parts of Germany. Due to the long-term socialist political influence in the former GDR, the east of Germany has a longer tradition of women's participation in the labor force.²⁷ Conse-

²⁷ The socialist system was characterized by a strong emphasis on the dual-earner/state-carer system of family

quently, direct marginal utility from participation $\partial U_i \backslash \partial P_i$ is expected to be higher for eastern German women and the absolute effect of LOC on participation probabilities is likely to be lower. The observation numbers (columns 1 and 2 in bottom panel of Table 7) support this assumption. The participation probability is with 79% distinctly lower in the west of Germany than in the east of Germany (90%). The upper panel of columns 1 and 2 of Table 7 presents the marginal effects based on the subgroups of women living in the east and west of Germany. The results reveal that the significant positive marginal effect of a medium and a high LOC is distinctively larger for women in the west of Germany. The effect of a high LOC is not significantly different from zero for women in the east of Germany. The identified heterogeneity might nevertheless also be driven by differences in the availability of childcare between the east and west of Germany. Nevertheless, shares of children in public childcare for different age-groups are included as controls in all estimation models. Additionally, a heterogeneity analysis with respect to those shares is less clear and gives no indication for heterogeneity in this respect.²⁸

Based on the continuous decrease in the importance of traditional gender roles over time in almost all modern Western societies (see e.g. Goldin, 2006), women in later cohorts are assumed to be more affected by a generalized social pressure to be economically independent from external forces than women of earlier cohorts (Heim, 2007). For the former, $\partial U_i \backslash \partial P_i$ can be assumed to be higher than for the latter. They might therefore have a higher participation probability independent from LOC as their utility from participation is higher. Thus, columns 3 to 5 of Table 7 present the marginal effects based on the estimations in which the marginal effect of LOC is calculated fully separated for different cohorts. The cutoffs for the manifestations of the birth cohort indicator "early", "middle" and "late" were generated based on the terciles of year of birth in the full estimation sample, i.e. $P(33) = 1958$ and $P(66) = 1966$, in order to obtain groups of approximately similar size. The results indicate a strong heterogeneity of the effect with respect to cohort. The distinct marginal effects of a medium and high LOC on participation probabilities can only be observed for women from the early cohorts, i.e. born before 1958 (column 3). The effect is distinctly lower for both the women in the medium as well as in the latest cohorts (columns 4 and 5).

As the heterogeneity with respect to cohort might also be driven by age effects, the heterogeneity was repeated by making use of the longitudinal nature of the data. The observations are thus cut into three groups based on the observation periods 1999-2005, 2005-2010 and 2010-2015. The cutoffs are informed by the LOC observation waves 2005 and 2010. The results reported in

labor supply, i.e. an extremely high levels of female labor force participation in combination with an extensive system-level organization of family-support structures and child care (see e.g. Braun *et al.*, 1994; Rosenfeld *et al.*, 2004).

²⁸ Results are available from the author upon request.

Table 8: Additional Results (Marginal Effects): Outcome Variable - Labor Force Activity

	Sample: All Employed								
	Employment			No Marginal			Full-Time		
	All	Kids <16	Cohab.	All	Kids <16	Cohab.	All	Kids <16	Cohab.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
Locus of Control Terciles (Ref.: [LOC_{min} , LOC_{P33}])									
$(LOC_{P33}, LOC_{P66}]$	0.028*** (0.005)	0.031*** (0.010)	0.031*** (0.006)	-0.001 (0.002)	-0.004 (0.006)	-0.000 (0.002)	0.010 (0.010)	-0.004 (0.015)	-0.007 (0.011)
$(LOC_{P66}, LOC_{max}]$	0.030*** (0.005)	0.032*** (0.011)	0.031*** (0.007)	0.001 (0.002)	-0.005 (0.006)	0.002 (0.002)	0.013 (0.011)	-0.006 (0.017)	-0.003 (0.012)
Observations ¹	53,907	20,936	43,376	40,225	13,874	31,548	40,225	13,874	31,548
LF = 0	13,682	7,062	11,828	3,736	2,021	3,350	18,606	9,078	15,828
LF = 1	40,225 (75%)	13,874 (66%)	31,548 (73%)	36,489 (91%)	11,853 (85%)	28,198 (89%)	21,619 (54%)	4,796 (35%)	15,720 (50%)
All Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓

Source: SOEP, waves 2000 - 2016, version 33, doi:10.5684/soep.v33, own calculations.

Notes: Standard Errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

¹ Self-employed are dropped from the sample as working hours cannot be determined for them.

columns 6 to 8 support the identified heterogeneity in the previous sub-group analysis. The effect size seems to decrease over time, supporting the idea of increasing social norms for working.

5.4 Labor Force Activity, Working Hours and Lifetime Participation

The behavioral implications of LOC on labor force availability has been the center of attention in the theoretical considerations as well as the main part of the empirical analysis. Nevertheless, it is interesting to investigate whether those static behavioral effects actually translate into higher employment probabilities and higher average lifetime participation, as these are the variable with the desired positive macro- and microeconomic consequences in the long run. If a higher probability of being available to the market for internal women does not translate into higher employment probabilities, the positive economic implications of LOC are limited by other unobserved factors such as e.g. market conditions and frictions.

In order to assess the generalizability of the results with respect to the choices made about the participation indicator as described in Section 4.1, three major components of the dependent variable are investigated: 1) the concentration on labor force availability instead of labor force activity, 2) the restriction to the extensive margin as well as 3) the focus on an one-period discrete choice rather than a lifetime perspective on labor force participation.

Table 8 starts by giving the results of the investigations with respect to the first two points. As a first step, the dependent variable is adjusted such that it only captures labor force activity instead of availability. Thus, the indicator is one if a women is actually employed and zero if she is unemployed or not-working independent from whether she intends to work by searching for a

job.²⁹ This alternative definition was neglected in the main part of the empirical analysis as it captures unobserved returns to locus of control with respect to employment probabilities and therefore does not concentrate on the behavioral aspects of labor force participation.

Columns 1 to 3 of Table 8 give the results of this new indicator while still concentrating on the extensive margin. The results indicate that the behavioral changes are fully translated into higher employment probabilities. The effects are considerably stronger than in the main estimations. This is likely due to unobserved returns to LOC in employment probabilities. Having a high LOC thus on average increases the probability of being employed by 3 percentage points for the full sample (column 1). This is also true for the sub-samples of mothers (column 2) and cohabited women (column 3).

In addition to this, columns 4 to 9 give the estimated marginal effects of LOC on participation indicators at the intensive margin. For the sub-sample of all women who are employed ($LF = 1$ in columns 1 to 3), the outcome variable in columns 4 to 6 indicates whether the woman is employed at least part-time and consequently not marginally employed, defined as 15 contracted working hours per week or more. Additionally, the outcome variable in columns 7 to 9 indicates whether a woman is full-time employed, defined by at least 35 contracted working hours per week. While LOC positively affects labor force availability as well as participation at the extensive margin, no effects can be identified at the intensive margin. This is largely in line with the theoretical idea of LOC mainly affecting the non-monetary gains from participation independent from the amount of working hours.

Additionally, the lifetime perspective needs to be considered in order to get an idea about whether this static relationship actually translates into differences for the whole working life. Thus, in the additional results presented in Table 9, the accumulated years in the labor force as well as in employment between the age of 25 and 55 are the outcome variables of interest. Using the detailed biographical information available for every SOEP participant, the aggregated time in the labor force is calculated by adding the years a woman spent in employment or registered unemployment during those 30 years.³⁰ As no biographical information is available on the job-search behavior, I have to rely on the reported labor force status in order to identify labor force participation here. As job-search is likely to be an important determinant of true willingness to participate, it has to be taken into account that this is thus only a rough measure of participation. The cross-sectional estimation sample consists of one observation per woman in the first available

²⁹ In this specification, self-employed women are set to missing as it is not possible to identify working hours for these women in the further steps. Nevertheless, the results for the indicator at the extensive margin do not strongly differ if self-employed women are included. Results are available upon request.

³⁰ A woman is assumed to spend a full year in a certain labor force status if she only reports one spell during a certain year. If she reports multiple spells during one year, she is assumed to have spend an equal share of the year in either spell and consequently the value $(1/\text{number of spells})$ is added to the counter.

Table 9: Additional Results (Marginal Effects): Outcome Variable - Aggregated Participation (Sample: 55+)

	Sample: Cross-Section - Women 55+					
	Years in Labor Force 25-55y			Years Employed 25-55y		
	All	Kids ²	Cohab.	All	Kids ²	Cohab.
	(1)	(2)	(3)	(4)	(5)	(6)
Locus of Control Terciles (Ref.: [LOC_{min} , LOC_{P33}]) ¹						
(LOC_{P33} , LOC_{P66})	0.180 (0.351)	0.216 (0.376)	0.251 (0.402)	0.759** (0.360)	0.782** (0.384)	0.622 (0.406)
(LOC_{P66} , LOC_{max})	0.835** (0.372)	0.701* (0.396)	0.716* (0.423)	1.531*** (0.381)	1.399*** (0.404)	1.158*** (0.428)
Observations	3,255	2,909	2,640	3,255	2,909	2,640
All Controls	✓	✓	✓	✓	✓	✓

Source: SOEP, waves 2000 - 2016, version 33, doi:10.5684/soep.v33, own calculations.

Notes: Standard Errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

¹ Locus of Control is calculated based on the average over all available LOC observations.

² The sub-group consists of all women with any biological children at time t independent from their age.

year in the sample in the age of 55 or later. Only women who have valid information on their labor force status during at least 25 of those 30 years are considered. The explanatory variable is a measure for the average locus of control over all available observations. This is largely in line with the sensitivity reported in Section 6.2 and is intended to reduce the problem of regression attenuation in the present case as LOC at time t might be measured long after the relevant decision periods.³¹ The effects are estimated using a simple linear regression model.

The results presented in Table 9 indicate a significant positive effect of LOC on lifetime labor force availability and activity during those 30 years. Women with a high average LOC spend on average approximately 0.8 years more in the labor force (column 1) and 1.5 more years in employment (column 4) during this time.³² The effect is relatively homogeneous with respect to the marital status as well as indicator for children (of any age) at time t .

6 Sensitivity Analysis

6.1 Controlling for Endogenous Budget Constraints

As has been discussed in the theoretical considerations, differences in the participation probabilities between internal and external women might also be driven by omitted differences in the objective budget constraints rather than the proposed differences in preferences or beliefs. Thus,

³¹ Although smaller in magnitude, the effects are still significant if instead the imputed LOC at time t is used. Results are available upon request.

³² The lower estimates for labor force participation are likely to be driven by the rough measure of participation here as no information on job search is available and also all other alternative labor force statuses such as retirement and education influence the overall number of years. As internal women are observed to spend less years in registered unemployment, this drives the estimated results downwards.

controlling for them is necessary to identify the direct behavioral effect of LOC on participation decisions instead of the indirect effects through differences in opportunities and constraints such as occupational selection, wage differences and assortative mating. The results from this additional estimations can be found in Table A.4 in the Appendix.

Controlling for those potentially endogenous variables is, however, less straightforward than expected. Simply including the information on the current or last job would leave us with a large multicollinearity problem caused by the characteristics themselves, but also by their availability in general. The information on employment characteristics (occupation and wage) has to be imputed from the last employment or self-employment spell if a woman is not (self-)employed at the moment. Nevertheless, it is not possible to observe any information on employment for a lot of women if they were either never employed or at least never employed during their time in the SOEP³³. This is, by definition, more often the case in the group of women who do not participate in the labor force at the moment. When controlling for the employment information, the indicator for non-availability of the information would thus be a “bad control”, in line with the arguments by Angrist and Pischke (2008), as it is highly multi-collinear with the labor force participation indicator. Not only are external women more likely to be observed outside the labor force at the moment, but they are also more likely never to be observed in the labor force, and the indicator could just as well be a dependent variable in the estimation model. To disentangle the endogeneity problem from the true effects of controlling for occupational characteristics and wages, column (1) of Table A.4 starts by reducing the observation sample to the women who are observed in occupation during their time in the SOEP at least once. In line with expectations, the estimated effects for the LOC drop if the sample is reduced, indicating an endogeneity problem in the observability of information. The estimated effects from this reduced sample are taken as the new baseline in the following in order to eradicate parts of the bad controls problem. Nevertheless, it has to be taken into account that also the occupational information themselves are potentially endogenous. Therefore, the presented results have to be interpreted with care.

Occupational Choice Column 2 of Table A.4 starts by adding potentially omitted information on the industry and occupational type of women in their current or last job as measures of occupational selection based on locus of control. Nevertheless, if the last occupational type and the last industry classification are included, the estimated effects for LOC do not change. Hence, this can be taken as an indication of no severe bias through omitted occupational information in

³³The problem can be slightly weakened by using information on the very first employment of women given in the biography questionnaire, which is answered by every SOEP-responder. If no information on occupational type or industry is available during the time in the SOEP, this information is used. Nevertheless, no wage information is available from the biographical data.

the main estimations. An effect of LOC on participation probabilities via occupational selection and differences in the expected future costs of non-participation can thus be rejected.

Wage Differences Secondly, it is necessary to consider wage returns to LOC as potential omitted drivers of the identified effects. In order to investigate the importance of this channel, a proxy for the expected wage from working has to be included as a control variable. Column 3 of Table A.4 presents the results of the sensitivity check in which additionally to the occupational information also the net labor income of the last observed working spell is included as a proxy for the expected wage of a potential future employment. If the reduced sample is used and the last labor net income is included as a control variable, this does not further change the estimated coefficient for LOC. The coefficient of the last net labor income has the expected positive sign. Omitted variable bias can therefore be rejected with respect to a demand-side response to LOC via higher expected wages, too.

Assortative Mating - Partner's Wage and Personality As a third set of variables that might explain parts of the estimated relationship, information on a woman's partner has to be controlled for. Fortunately, the SOEP makes it possible to merge cohabiting women with their partners. Thus, columns 4 to 6 of Table A.4 present the results of the sensitivity check in which the partner's current net labor income as well as the continuous LOC factor of the partner is included as an additional control variable for cohabiting women. In line with the procedure in the paragraphs above, the results of the baseline estimation for the reduced sample of all women for whom it is possible to merge the partner's wages and locus of control are presented in column 4 of Table A.4. As can be seen in columns 5 and 6, the results do not change if partner's net income and LOC are included as control variables, indicating that the results of the main estimation are not severely biased by assortative mating. As partners labor income is already captured by the indicator for family income in the main estimations, the effect of partners income is, although significantly negative, rather small. Partners LOC has no significant effect at all. Admittedly, remaining concerns about various other possible interdependencies between partners such as those with respect to gender attitudes cannot be completely ruled out. Internal women might, for instance, be more likely to mate with men who have more tolerant gender attitudes and are thus more likely to participate. These characteristics are assumed to be largely captured by the partner's locus of control and earnings. The fact that the positive relationship between LOC and participation decisions can also be identified for single mothers, however, provides some reassurance that assortative mating does not drive large parts of the estimated relationship.

6.2 Locus of Control Construction and Imputation

As a second important set of sensitivity checks, the construction and imputation of the locus of control as explanatory variable is tested. Table A.5 in the Appendix presents the results of three alternative forms of construction and imputation of the LOC factor: (a) a simple index, (b) an average over all observations as well as (c) an imputation from the closest employment spell. All checks are conducted using the full estimation sample and the full set of control variables. The baseline results are replicated in columns 1 and 2. Columns 3 and 4 provide the re-estimated effects when varying the construction of the LOC factor in the observation years. Instead of using the results of the factor analysis, the “simple index” assumes equal weights of all 8 items used, and a simple average over all item responses is calculated. The results differ only marginally from those in the baseline.

Secondly, the timing of the LOC measurement and thus the imputation approach is tested. As Preuss and Hennecke (2018) pointed out, there is a considerable risk of reverse causality or attenuation bias due to temporary measurement errors in the LOC. Using the same data from the SOEP, they found a significant negative short-run effect of exogenous job-loss on LOC for individuals who are still unemployed during the LOC interview. Based on an extensive sensitivity check, they conclude that this is likely to be driven by temporary state-dependent reporting in the LOC for unemployed individuals even though LOC can be assumed to be stable in the long-run. Due to the fact that employed and non-employed individuals are pooled in my estimation sample, there might be a risk of biased results due to a measurement bias in LOC, which would, by definition, be greater in the group of non-participating women due to a higher share of non-employed individuals in this group³⁴. In order to circumvent this measurement problem, two alternative approaches are implemented. Firstly, instead of the forward imputed LOC, a variable which averaged all available LOC observations of an individual between 1999 and 2015 is used as the explanatory variable. This approach is likely to reduce the attenuation bias in the LOC due to temporary measurement errors to a minimum. The results of this alternative estimation are presented in columns 5 and 6 of Table A.5. In line with expectations about biases due to regression attenuation, the estimated effects increase considerably if this alternative LOC measure is used. This gives indication for a downward bias due to measurement error in the LOC variable in the main estimations. Although these new results might again be biased upwards by reverse causality, the main estimations are likely to only be lower bounds of the true effects.

Using the average LOC nevertheless does not solve problems with reverse causality if the

³⁴ While in the group of participating women potentially only some of the women, i.e. those who are unemployed, might have a state-bias in their observed LOC, the share is expected to be greater in the group of non-participating women as 100% of women in this sample might be affected by such a state-bias.

measurement error is selective as women who are not employed in t have a higher probability to also be not employed in the periods before and after t . Those women thus always report a lower LOC due to their non-activity on the labor market. Therefore, additionally the LOC observation during the closest employment or self-employment spell to t is used. The two conditions for imputing the LOC observation from a period $t + x$ or $t - x$ into t are that (a) LOC has to be observed in that year and (b) the woman is observed to be employed or self-employed in that year.³⁵ Nevertheless, this approach has one main caveat: by imputing from the closest employment spell, all women who are never observed in (self-)employment are lost. This is largely in line with the problems discussed in the first paragraph of the sensitivity section. Never being observed in (self-)employment is highly endogenous to the model in line with the argumentation above. Columns 7 and 8 of Table A.5 thus check the effect of the LOC variable in the baseline model, using only the sample of women for which the LOC variable from the closest employment is observed. As expected, although still positive and significant, the estimated effect is now considerably smaller, indicating a problem with endogeneity in the observability of employment spells. Based on this reduced sample, columns 9 and 10 present the results for the alternative approach of imputation for the LOC factor. When using the reduced sample, the alternative LOC variable actually increases the estimated effects. Thus, if the main estimations are at risk of being biased, this is likely to be a bias towards zero as opposed to an overestimation of effects.

7 Conclusion

How do women make decision about their labor force participation at a given point in time and what factors determine heterogeneity in participation probabilities between and within genders? This is a question economists have already been interested in for many years of fruitful theoretical and empirical research. Nevertheless, we are still far from solving the puzzles within this long-lasting “hot topic” in labor economics. While a lot of open questions have been answered on the gender gap in labor market participation with especially wages gaps and differences in social norms for working and gender roles being key determinants of the differences between men and women, the prevalent within-gender heterogeneity still keeps economists and politicians busy. When getting to a point at which standard economic theories are unable to fully explain individual decision making with observed opportunities and constraints, traditional approaches often contribute remaining heterogeneity to stochastic idiosyncratic shocks (see e.g. McFadden, 1974;

³⁵ I also allow for backwards imputation to avoid problems with sample size. This is based on the assumption that, besides measurement bias in LOC through non-employment, non-employment has no long-term effect on LOC based on the findings in Preuss and Hennecke (2018).

Borghans *et al.*, 2008). Nevertheless, with the advancement of modern behavioral economics and applied microeconomics in combination with an increased availability of comprehensive survey-data, economists got more and more interested in understanding the psychological black box behind unexplained individual differences.

In line with this, especially in the last couple of years, empirical economic research was increasingly informed by ideas from psychology. A huge body of empirical literature provides evidence for the importance of especially personality traits for individual decision making in various domains of the individual life-cycle. This paper contributes to this line of research in the context of female labor force participation by theoretically and empirically discussing the role of the personality trait locus of control for differences in participation probabilities between women. Due to the rich facets of the construct locus of control, it can be assumed to influence multiple components of a woman's maximisation problem when choosing the optimal labor force status. Nevertheless, in line with the existing literature, a crucial role of LOC for independence preferences and expected returns to investment decisions and thus a positive relationship with the direct marginal utility from participation but also home production through subjective monetary and non-monetary gains is expected.

Based on the theoretical considerations, a reduced form estimation of the relationship between LOC and a woman's probability of being available to the labor market is the center of the empirical analysis. Using a random effects logit model, I find that internal women, i.e. women who believe in the importance of their own efforts for life's outcomes, are on average more likely to be available to the labor force. LOC thus adds explanatory power to the participation decision above and beyond traditional socio-economic factors as well as other preferences measures. Hence, the paper significantly adds to the existing economic literature on female labor force participation as well as the important economic consequences of locus of control by suggesting and empirically identifying distinct behavioral implications of LOC in the participation decision. Hence, the paper primarily contributes to the investigation of the psychological black box behind female labor force participation and additionally broadens the knowledge on the economic importance of locus of control.

On the other hand, a heterogeneity analysis identified an interesting sensitivity of the effect with respect to given monetary constraints as well as prevalent social working norms. This suggests that inherent traits, preferences and tastes are only able to inform participation decisions if the underlying budget constraints are fulfilled and if the decision-making is not constrained by exogenous imposed social norms. It seems natural to argue that this is not a phenomenon which is specific to locus of control but very likely also translates to other measures of psychological

traits and economic preferences. This neatly fits into the recent findings by Falk and Hermle (2018), who identified a similar importance of economic development for gender-inequality on the macro-level.³⁶

The identified role of locus of control for a woman's decision-making process as well as the prevalent importance of exogenous constraints in the relationship has crucial implications for the widespread political discourse about low labor force participation rates of women. When discussing and evaluating political measures targeted at increasing participation rates, such as active labor market policies, quotas or childcare availability and costs, it is therefore extremely important to understand the boundaries of monetary incentives set by latent psychological characteristics. Considerations about the effectiveness of active labor market policies need to be aware of the large component in individual decision making which cannot be influenced by monetary incentives as it is based on inherent personal attributes and preferences for either participation or home production. As opposed to this, the results from the heterogeneity analysis also illustrates that preference-based decision making is massively bounded by exogenous monetary and non-monetary constraints. Reducing them would presumably raise individual welfare as individual's freedom of choice is increased. Although locus of control arguably is a trait which is of specific interest for participation considerations, due to its focus on effort and independent action, those findings are highly relevant also above and beyond this special case and the considerations are likely to be universally valid also for other traits and preferences.

³⁶ They identified that higher levels of economic development as well as gender equality favor the manifestation of gender differences in economic preferences under the rational that greater availability of material resources removes the universal goal of subsistence and more gender-equal access to those resources allows women and men to express preferences independently from each other.

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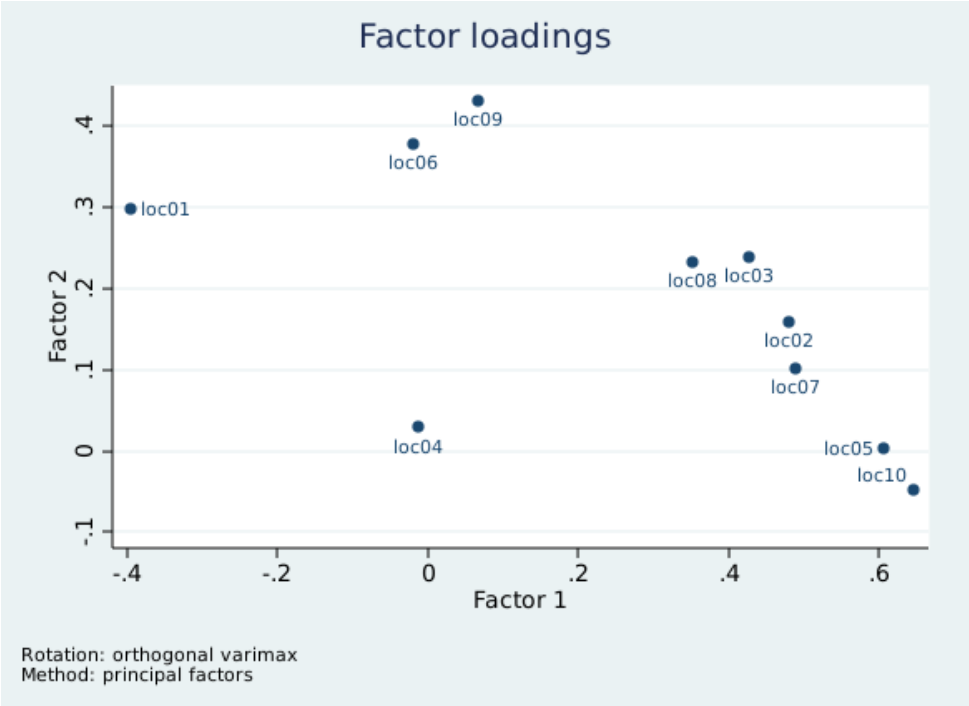
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A Appendix

Figure A.1: Factor Loadings of the LOC Variable



Source: SOEP, waves 1999, 2005, 2010 and 2015, version 33, own illustration.

Table A.1: Descriptive Statistics

	(1)	(2)	(3)	(4)
	All	Children under 16	Not Cohabiting	Cohabiting
	<i>mean</i>	<i>mean</i>	<i>mean</i>	<i>mean</i>
Family Controls				
Family Status	.			
Single	0.13	0.08	0.68	
Partner not in HH	0.06	0.04	0.32	
Partner in HH	0.10	0.09		0.13
Married	0.70	0.78		0.87
Number of Children	1.62	2.03	1.19	1.72
Children Age Indicators				
Child under 1	0.03	0.07	0.01	0.03
Child 1 - 3	0.06	0.15	0.02	0.07
Child 3 - 7	0.13	0.33	0.07	0.14
Child 7 - 16	0.28	0.72	0.20	0.30
Family Income				
Low	0.33	0.22	0.86	0.20
Medium	0.33	0.37	0.09	0.39
High	0.34	0.42	0.05	0.42
Socio-Demographic Controls				
Age Categories				
25 - 34 Years	0.21	0.31	0.28	0.19
35 - 44 Years	0.30	0.52	0.27	0.31
45 - 54 Years	0.31	0.16	0.28	0.31
55 - 65 Years	0.18	0.00	0.17	0.19
Religion				
Non	0.32	0.27	0.37	0.31
Christian	0.64	0.67	0.61	0.65
Muslim	0.02	0.03	0.01	0.02
Other	0.02	0.03	0.01	0.02
In Bad Health	0.14	0.09	0.17	0.13
Highest School Degree				
No School Degree	0.02	0.02	0.01	0.02
Lower Secondary School	0.24	0.21	0.24	0.24
Middle School	0.40	0.42	0.37	0.41
Highschool	0.28	0.28	0.33	0.26
Other School	0.06	0.07	0.05	0.07
Highest Vocational Degree				
No Vocational Diploma	0.15	0.16	0.16	0.15
Apprenticeship	0.43	0.42	0.41	0.43
Higher Technical College	0.28	0.30	0.28	0.29
College or University Degree	0.24	0.21	0.26	0.23
Regional Controls				
East-Germany	0.27	0.24	0.29	0.27
Unemployment Rate	9.08	9.00	9.13	9.07
Gross Value Added	54.00	53.75	54.54	53.86
Population Density in 100	5.36	5.06	6.31	5.13
Median Full-Time Income Women	2551.62	2559.18	2565.92	2548.12
Public Childcare				
Children under 3y in Care	23.08	21.59	24.39	22.75
Share of Full-Time Care (<3y)	44.98	43.38	46.01	44.72
Children 3 - 6y in Care	92.31	92.15	92.33	92.30
Share of Full-Time Care (3-6y)	37.04	35.01	38.31	36.72
Median Costs for Full-time Care	98.37	99.56	97.36	98.62
Personality Controls				
Willingness to take risk (std., avg.)	-0.20	-0.18	-0.10	-0.22
Openness (std., avg.)	0.03	0.01	0.12	0.01

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	(1)	(2)	(3)	(4)
	All	Children under 16	Not Cohabiting	Cohabiting
Conscientiousness (std., avg.)	0.07	0.03	0.07	0.07
Extraversion (std., avg.)	0.10	0.16	0.08	0.10
Agreeableness (std., avg.)	0.18	0.20	0.13	0.19
Neuroticism (std., avg.)	0.15	0.16	0.12	0.16
Observations	57,308	22,219	11,267	46,041
Individuals	7,724	3,617	2,305	6,565

Source: SOEP, waves 2000 - 2016, version 33, doi:10.5684/soep.v33, own calculations.
Notes: Clustered Standard Errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.2: Main Results (Marginal Effects) - Full Results

	All	Children under 16	Cohabiting
	(1)	(2)	(3)
Locus of Control Terciles (Ref.: [LOC_{min} , LOC_{P33}])			
(LOC_{P33} , LOC_{P66})	0.013*** (0.003)	0.022*** (0.007)	0.015*** (0.004)
(LOC_{P66} , LOC_{max})	0.014*** (0.004)	0.022*** (0.008)	0.015*** (0.005)
Family Controls			
Family Status (Ref.: Single)			
Partner not in HH	0.006 (0.006)	0.006 (0.019)	
Partner in HH	0.011** (0.006)	0.064*** (0.016)	
Married	-0.015*** (0.005)	0.049*** (0.015)	
Number of Children	-0.020*** (0.002)	-0.034*** (0.005)	-0.023*** (0.003)
Has Child under 1	-0.750*** (0.014)	-0.723*** (0.014)	-0.775*** (0.013)
Has Child 1 - 3 Years	-0.314*** (0.013)	-0.308*** (0.015)	-0.343*** (0.014)
Has Child 3 - 7 Years	-0.044*** (0.005)	-0.027*** (0.006)	-0.044*** (0.005)
Has Child 7 - 16 Years	-0.005 (0.003)	0.027*** (0.009)	-0.003 (0.004)
Family Income (Ref.: Low)			
Medium	-0.039*** (0.003)	-0.087*** (0.006)	-0.044*** (0.003)
High	-0.085*** (0.005)	-0.177*** (0.009)	-0.096*** (0.005)
Socio-Demographic Controls			
Age Categories (Ref.: 25 - 34 Years)			
35 - 44 Years	0.013*** (0.004)	0.027*** (0.008)	0.016*** (0.004)
45 - 54 Years	0.007 (0.005)	0.038*** (0.011)	0.007 (0.006)
55 - 65 Years	-0.068*** (0.008)	-0.002 (0.046)	-0.084*** (0.010)
Religion (Ref.: No Religious Affiliation)			
Christian	0.001 (0.004)	0.002 (0.010)	-0.002 (0.006)
Muslim	-0.053*** (0.016)	-0.117*** (0.029)	-0.066*** (0.020)
Other	-0.034*** (0.013)	-0.071*** (0.025)	-0.059*** (0.018)
In Bad Health	-0.025*** (0.004)	-0.029*** (0.009)	-0.026*** (0.005)
Highest School Degree (Ref: No Degree)			
Lower Secondary School	0.018 (0.015)	0.071** (0.029)	0.015 (0.020)
Middle School	0.065*** (0.014)	0.117*** (0.033)	0.070*** (0.018)
Highschool	0.067*** (0.011)	0.126*** (0.027)	0.070*** (0.015)
Other School	0.031** (0.013)	0.060** (0.027)	0.033** (0.017)
Highest Vocational Degree (Ref.: No Vocational Diploma)			
Apprenticeship	0.032*** (0.006)	0.046*** (0.012)	0.034*** (0.008)
Higher Technical College	0.044*** (0.005)	0.062*** (0.011)	0.047*** (0.007)
College or University Degree	0.053*** (0.005)	0.077*** (0.011)	0.064*** (0.006)
Regional Controls			
East-Germany	-0.004 (0.020)	-0.005 (0.042)	0.013 (0.023)
Unemployment Rate	-0.002**	-0.000	-0.002

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	(1)	(2)	(3)
Gross Value Added	(0.001) -0.000 (0.000)	(0.002) -0.000 (0.001)	(0.001) -0.000 (0.000)
Population Density in 100 0.000	0.000 (0.000)	0.001 (0.001)	(0.001) (0.001)
Median FT Income Women	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Public Childcare			
Children under 3y in Care	0.001** (0.000)	0.001 (0.001)	0.001* (0.001)
Share of Full-Time Care (<3y)	-0.000 (0.000)	-0.001* (0.000)	-0.000 (0.000)
Children 3 - 6y in Care	0.002*** (0.001)	0.003*** (0.001)	0.003*** (0.001)
Share of Full-Time Care (3-6y)	0.000 (0.000)	0.000 (0.001)	0.000 (0.000)
Median Costs for Full-time Care	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
Personality Controls			
Willingness to Take Risk (std., avg.)	0.013*** (0.004)	0.007 (0.007)	0.019*** (0.005)
Openness (std., avg.)	-0.004 (0.003)	-0.003 (0.006)	-0.006 (0.004)
Conscientiousness (std., avg.)	0.021*** (0.003)	0.022*** (0.006)	0.023*** (0.004)
Extraversion (std., avg.)	0.011*** (0.003)	0.016*** (0.005)	0.015*** (0.003)
Agreeableness (std., avg.)	-0.005 (0.003)	-0.006 (0.006)	-0.004 (0.004)
Neuroticism (std., avg.)	-0.013*** (0.003)	-0.009 (0.006)	-0.017*** (0.004)
Observations	57,308	22,219	46,041
Year Fixed-Effects	✓	✓	✓

Source: SOEP, waves 2000 - 2016, version 33, doi:10.5684/soep.v33, own calculations.
Notes: Clustered Standard Errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.3: Heterogeneity Analysis: Age of Children

	Children under 16 ¹				Adult Child
	Baby 0-1 (1)	Toddler 1-3 (2)	Pre-School 3-7 (3)	School Age 7-16 (4)	over 16 (5)
Locus of Control Terciles (Ref.: [LOC_{min} , LOC_{P33}])					
(LOC_{P33} , LOC_{P66})	0.021 (0.020)	0.018 (0.031)	0.041*** (0.016)	0.010** (0.005)	0.006* (0.004)
(LOC_{P66} , LOC_{max})	0.003 (0.019)	0.044 (0.032)	0.060*** (0.017)	0.011** (0.005)	0.013*** (0.004)
Observations	1,565	3,392	7,314	12,050	23,873
LF = 0	1,319	1,747	2,400	1,820	4,165
LF = 1	246 (16%)	1,645 (49%)	4,914 (67%)	10,230 (85%)	4,165 (86%)
All Controls	✓	✓	✓	✓	✓

Source: SOEP, waves 2000 - 2016, version 33, own calculations.

Notes: Standard Errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

¹ The groups are not mutually exclusive. Women are included if they have at least one child in the respective age-group.

Table A.4: Additional Results (Marginal Effects): Confounders (Sample: All)

	Sample: Ever Employed			Sample: With Partner		
	(1)	(2)	(3)	(4)	(5)	(6)
Locus of Control Terciles (Ref.: [LOC_{min}, LOC_{P33}])						
(LOC_{P33} , LOC_{P66})	0.008*** (0.002)	0.008*** (0.002)	0.007*** (0.002)	0.017*** (0.004)	0.017*** (0.004)	0.017*** (0.004)
(LOC_{P66} , LOC_{max})	0.010*** (0.002)	0.010*** (0.003)	0.010*** (0.003)	0.016*** (0.005)	0.015*** (0.005)	0.015*** (0.005)
Occupational Type in Last Employment (Ref.: Blue-collar Worker)						
White-collar Worker		0.010*** (0.003)	0.008*** (0.003)			
Civil Servant		0.023*** (0.006)	0.014** (0.007)			
Other Occupations		-0.068*** (0.023)	-0.064*** (0.022)			
Not Available		-0.062*** (0.023)	-0.062*** (0.023)			
Industry in Last Employment (Ref.: Manufacturing)						
Agriculture		-0.033** (0.014)	-0.031** (0.014)			
Mining, Quarrying, Energy, Water		0.026*** (0.009)	0.026** (0.010)			
Chemicals, Pulp, Paper		0.010* (0.006)	0.011* (0.006)			
Construction		0.007 (0.007)	0.009 (0.008)			
Iron/Steel		-0.000 (0.009)	-0.001 (0.009)			
Textile/Apparel		-0.036*** (0.014)	-0.034** (0.014)			
Wholesale/Retail		-0.005 (0.005)	-0.002 (0.005)			
Transport/Communication		0.004 (0.007)	0.006 (0.007)			
Public Service		0.011** (0.004)	0.014*** (0.005)			
Financials/ Private Services		0.001 (0.005)	0.004 (0.005)			
Other		0.006 (0.005)	0.010* (0.006)			
Not Available		-0.073*** (0.011)	-0.072*** (0.011)			
(Last) Net Labor Income (KEUR)				0.015*** (0.002)		
Partner						
Net Labor Income (KEUR)					0.004*** (0.001)	0.004*** (0.001)
Partners LOC Factor (cont.)						0.000 (0.002)
Observations	53,751	53,751	53,751	39,915	39,915	39,915
All Controls	✓	✓	✓	✓	✓	✓

Source: SOEP, waves 2000 - 2016, version 33, own calculations.
Notes: Standard Errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A.5: Sensitivity Analysis (Marginal Effects): Locus of Control (Sample: All)

	Full Sample						Filled Employment Sample			
	Baseline		Simple Index ¹		Average ²		Baseline		Closest Employment ³	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
LOC Factor (cont.)	0.008***		0.008***		0.012***		0.004***		0.004***	
	(0.002)		(0.002)		(0.002)		(0.001)		(0.001)	
Locus of Control Terciles (Ref.: [LOC_{min} , LOC_{P33}])										
(LOC_{P33} , LOC_{P66})		0.013***		0.012***		0.016***		0.005***		0.009***
		(0.003)		(0.003)		(0.006)		(0.002)		(0.002)
(LOC_{P66} , LOC_{max})		0.014***		0.012***		0.022***		0.007***		0.010***
		(0.004)		(0.004)		(0.006)		(0.002)		(0.002)
Observations	57,308	57,308	57,308	57,308	57,308	57,308	50,129	50,129	50,129	50,129
All Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Source: SOEP, waves 2000 - 2016, version 33, doi:10.5684/soep.v33, own calculations.

Notes: Standard Errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

¹ LOC Factor for each year is calculated using a simple average of all 8 items. The Index is then imputed using the same rule as in the baseline.

² LOC Factor is calculated for each year as in the baseline but is imputed as an average over all available LOC observations.

³ LOC Factor is calculated for each year as in the baseline but is imputed from the closest LOC observation in which the individual was employed or self-employed and not from the last LOC observations.