Marital Matching, Economies of Scale and Intrahousehold Allocations*

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Abstract

We propose a novel structural method to empirically identify economies of scale in household consumption. We assume multi-person households with consumption technologies that define the public and private nature of expenditures through Barten scales. Our method recovers the technology by solely exploiting preference information revealed by households' consumption behavior. The method imposes no parametric structure on household decision processes, accounts for unobserved preference heterogeneity across individuals in different households, and requires only a single consumption observation per household. Our main identifying assumption is that the observed marital matchings are stable. We apply our method to data drawn from the US Panel Study of Income Dynamics (PSID), for which we assume that similar households (in terms of observed characteristics like age or region of residence) operate on the same marriage market and are characterized by a homogeneous consumption technology. This application shows that our method yields informative results on the nature of scale economies and intrahousehold allocation patterns. In addition, it allows us to define individual compensation schemes

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required to preserve the same consumption level in case of marriage dissolution or spousal death.

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1 Introduction

A defining characteristic of multi-person households is that some goods are partly or completely publicly consumed, which gives rise to economies of scale. Motivating examples include housing, transportation or commodities produced by household work. The level of these scale economies will generally depend on both the household technology, which defines the (public versus private) nature of goods, and the individual preferences of household members, which define the allocation of household expenditures to the different goods. Understanding the nature of scale economies allows for addressing a variety of questions on interpersonal and interhousehold comparisons of well-being (see, e.g., Chiappori and Meghir, 2014, and Chiappori, 2016). For example, what are the consumption shares of husbands and wives in alternative household types? What is the income compensation a woman should receive to guarantee the same material well-being after her husband passed away? How should this compensation vary with the number of dependent children? How relevant are scale economies for the assessment of inequality and poverty at the level of individual household members?

In the current paper, we propose a structural method to empirically identify economies of scale in household consumption. Our method recovers the consumption technology by solely exploiting preference information revealed by households' consumption behavior. We assume a household consumption model that has three main components. First, we follow Chiappori (1988, 1992) by assuming collective households that consist of individuals with heterogeneous preferences, who reach Pareto efficient intrahousehold allocations. Second, we adopt the framework of Browning, Chiappori and Lewbel (2013) and use Barten scales to define the public versus private nature of the goods consumed by the household (see also Barten, 1964, and Muellbauer, 1977). Finally, we exploit marriage market implications to identify households' scale economies. Particularly, we use stability of observed marriages as our key identifying assumption. Our empirical application will show that assuming marital stability significantly benefits the identification results. In this respect, our analysis fits within the economics perspective on marriage that was initiated by Becker (1973, 1974) and Becker, Landes and Michael (1977). These authors argue that individuals behave as rational utility maximizers when choosing their partners on the marriage market. We exploit this argument empirically and use the observed marital decisions to learn about the underlying individual preferences, household technologies and intrahousehold allocations, while explicitly accounting for economies of scale.

We extend the revealed preference methodology that was recently developed by Cherchye, Demuynck, De Rock and Vermeulen (2017). These authors derived the testable implications of stable marriage for observed household consumption patterns. They showed that these testable implications allow for identifying the within-household decision structure that underlies the observed household consumption behavior. An important difference between our study and the original one is that these authors assumed the public or private nature of goods to be known a priori to the empirical analyst. As an implication, their methodology cannot fully assess the impact of scale economies on the welfare related questions mentioned above. By contrast, our method will define the nature of goods a posteriori by empirically identifying good-specific Barten scales under the maintained assumption of stable marriage. It will account for the possibility that some goods are partly privately and partly publicly consumed. The basic intuition behind our identification strategy is that higher economies of scale imply more gains from marriage, which leads to more competition in the marriage market. Conversely, lower economies of scale lead to less gains from marriage, which reduces the incentive to be married. By assuming marital stability for the observed households, we can define informative upper and lower bounds on good-specific Barten scales for different households. This effectively "set" identifies the level of household-specific economies of scale.

Our identification method has a number of additional features that are worth emphasizing. First, it does not impose any functional structure on the within-household decision process, which makes it intrinsically nonparametric. Next, the method allows for fully unobserved preference heterogeneity across individuals in different households, and requires only a single consumption observation per household. Interestingly, we will show that we do obtain informative results on households' scale economies even under these minimalistic priors. In their empirical analysis, Browning, Chiappori and Lewbel (2013) assumed that males and females in households have the same preferences as single males and females. We show that it is possible to obtain informative identification results without that assumption, by exploiting the testable implications of marriage stability. We believe that this is an attractive finding, as Browning, Chiappori and Lewbel's assumption of preference similarity is often regarded to be overly restrictive.[1]

Our methodological extension of Cherchye, Demuynck, De Rock and Vermeulen (2017) is particularly relevant from a practical perspective. Admittedly, some data sets do contain fairly detailed information on the public and private nature of household consumption. See, for example, the Danish, Dutch and Japanese data that have been studied by, respectively, Bonke and Browning (2009), Cherchye, De Rock and Vermeulen (2012) and Lise and Yamada (2018). However, the more frequently used data sets (like the one of our own application) typically do not contain this information. Moreover, the public and private nature of expenditures (e.g. on transportation and household work) is often difficult to define. This paper opens the possibility to exploit marital

[1] Given the overidentification of the basic model of Browning, Chiappori and Lewbel (2013), there is room to parameterize preference changes due to marriage. Dunbar, Lewbel and Pendakur (2013) suggested an identification approach that no longer assumes that individuals in couples have the same preferences as singles. Their approach needs to assume either that preferences are similar across people for a given household type or, alternatively, that preferences are similar across household types for a given person. In our method, we account for fully unobserved preference heterogeneity across individuals in different households.

stability for the identification of within-household allocation patterns in such empirical settings.

To show its practical usefulness, we will apply our method to a cross-sectional household data set that is drawn from the 2013 wave of the US Panel Study of Income Dynamics (PSID). In this application, households allocate their full income (i.e. the sum of both spouses' maximum labor income and nonlabor income) to both spouses' leisure, two commodities produced through the spouses' household work and the consumption of a Hicksian aggregate good.[2] We build on the observation that household technologies are closely related to observable household characteristics. For example, it is often argued that the presence of children significantly impacts households' demand patterns (Browning, 1992). For our own sample of households, we find that households' consumption patterns vary substantially depending on the number of children, age, education level and region of residence (see Tables 17-20 in Appendix C.4).

By using our novel methodology, we can investigate how these diverging consumption patterns relate to households' economies of scale and intrahousehold allocations. For example, what is the effect of children on public consumption in households? Does it matter whether or not the husband has a college degree? Is the pattern of intrahousehold consumption sharing different according to the region of residence or the age category? Should we model household work as fully publicly consumed or also as partly private? To meaningfully analyze these questions, we will assume that similar households (in terms of, e.g., age, education, or region of residence) operate on the same marriage market and are characterized by a homogeneous consumption technology. Our method then yields informative results on the nature of scale economies and intrahousehold allocation patterns for alternative household types. In turn, we can address the well-being questions that we mentioned above. As a specific illustration, we will compute individual compensation schemes required to preserve the same material well-being in case of marriage dissolution or spousal death. In addition, we can show the importance of explicitly accounting for scale economies and associated intrahousehold allocation patterns when assessing poverty at the level of individual household members.

The rest of this paper unfolds as follows. Section 2 introduces our notation and the structural components of our household consumption model. Section 3 formally defines our concept of stable marriage. Section 4 presents the testable implications of our model assumptions for observed household consumption patterns. Here, we will also indicate that these implications allow us to (set) identify households' economies of scale (i.e. Barten scales). Section 5 introduces the set-up of our empirical application. Section 6 presents our empirical findings regarding economies of scale for our sample of households, and Section 7 the associated results on the intrahousehold allocation of resources. Section 8 provides some concluding discussion.

[2]We implicitly consider two types of household technologies. The focus of this paper is on household technologies *à la* Browning, Chiappori and Lewbel (2013), which are associated with economies of scale. The other type of household technologies are related to the transformation of time spent on domestic work to commodities consumed inside the household in a Becker (1965) fashion. Under appropriate assumptions, a spouse's time spent on domestic production can serve as the output of the home produced good by this spouse. We will come back to this in Section 2.

2 Household Consumption

We study households that consist of two decision makers, a male m and a female f. As indicated above, our application will consider households that allocate their full income to spouses' leisure, household work and consumption of a Hicksian aggregate good. In what follows, we will provide more formal details on the household decision setting we have in mind. Subsequently, we will introduce our concept of consumption technology (with Barten scales). Finally, we will show how our set-up allows us to analyze households' economies of scale and intrahousehold allocation patterns.

Setting. We assume that each individual $i \in \{m, f\}$ spends his or her total time ($T \in \mathbb{R}_{++}$) on leisure ($l_i \in \mathbb{R}_+$), market work ($m_i \in \mathbb{R}_+$) and household work ($h_i \in \mathbb{R}_+$). The price of time for each individual is his or her wage ($w_i \in \mathbb{R}_{++}$) from market work. The time constraint for each individual is

$$T = l_i + m_i + h_i.$$

Let $q_{m,f} \in \mathbb{R}_+^K$ be a K-dimensional (column) vector denoting the observed aggregate consumption bundle for the pair (m, f). In our following empirical application, this vector will contain goods bought on the market (captured by a Hicksian aggregate good), as well as time spent on leisure and on household production by both individuals, which implies $K = 5$. Remark that each individual's time spent on household production actually represents an input and not an output that is consumed inside the household (see Becker, 1965). Under the assumption that each individual produces a different household good by means of an efficient one-input technology characterized by constant returns-to-scale, however, the individual's input value can serve as the output value. Note that this implies specialization with respect to the production of household goods rather than specialization with respect to market work versus household work (see also Pollak and Wachter, 1975, and Pollak, 2013). We will return to the possibility of considering more sophisticated intrahousehold production technologies in the concluding Section 8.

Consumption decisions are made under budget constraints that are defined by prices and incomes. For any pair (m, f), let $y_{m,f} \in \mathbb{R}_+$ denote the full potential income. Similarly, let $y_{m,\phi}$ and $y_{\phi,f} \in \mathbb{R}_+$ denote the full potential income of m and f when they are single. Further, let n_m and $n_f \in \mathbb{R}$ denote the nonlabor income of the two spouses. Specifically, we have:

$$\begin{aligned} y_{m,f} &= w_m T + w_f T + n_m + n_f, \qquad (1)\\ y_{m,\phi} &= w_m T + n_m \text{ and}\\ y_{\phi,f} &= w_f T + n_f. \end{aligned}$$

Next, we let $p_{m,f} \in \mathbb{R}_{++}^K$ represent the (row) vector of prices faced by the pair (m, f), and $p_{m,\phi}, p_{\phi,f} \in \mathbb{R}_{++}^K$ the (row) vectors of prices faced by m and f when they are single. In our application, the price of the Hicksian market good will be normalized at unity. The prices for leisure and household production will equal the observed individual wages. We will assume that individuals' wages are unaffected by marital status or spousal characteristics (i.e. there is no marriage premium or penalty), which implies that they remain the same as in the current marriage when individuals become single or remarry some other potential partner.[3]

Consumption technology. For any matched couple (m, f), the consumption bundle $q_{m,f}$ consists of a public part $Q_{m,f}$ that is shared by the husband and the wife. We define these public quantities $Q_{m,f}$ from the aggregate consumption quantities $q_{m,f}$ by using Barten scales. Specifically, we let A denote a $K \times K$ diagonal matrix that represents the degree of publicness for each individual good, with the k-th diagonal entry a_k representing the fraction of good k that is used for public consumption. If the k-th good is consumed entirely privately, then $a_k = 0$. Similarly, if the k-th good is consumed entirely publicly, then $a_k = 1$. In general, all entries of the technology matrix A are bounded between 0 and 1. The Barten scale is given by $(1 + a_k)$ for each good k; by construction, its value is between 1 (full private consumption) and 2 (full public consumption).[4]

If the pair (m, f) buys the bundle $q_{m,f} \in \mathbb{R}^K_+$, then the public quantities $Q_{m,f}$ can be represented as $Aq_{m,f} \in \mathbb{R}^K_+$, and $(I - A)q_{m,f} \in \mathbb{R}^K_+$ gives the corresponding private quantities. The private consumption bundle is shared between the partners. In particular, let $q^m_{m,f} \in \mathbb{R}^K_+$ and $q^f_{m,f} \in \mathbb{R}^K_+$ denote the spouses' private shares that satisfy the adding up constraint

$$q^m_{m,f} + q^f_{m,f} = (I - A)q_{m,f}.$$

For a given consumption bundle $q_{m,f}$, the household allocation is given by $(q^m_{m,f}, q^f_{m,f}, Aq_{m,f})$. So far, we did not put any restriction on the technology matrix A. In our empirical application, we will assume that married couples which are observationally similar are characterized by the same degree of publicness of the consumed goods. We will do so by conditioning the value of A on observable household characteristics. In particular, we will assume that a household's consumption technology for matched couples can vary with the number of children in the household, the region of residence, and the age and education level of the husband.[5] As we discuss in Sections 6 and 7, this assumption is sufficient to obtain informative empirical results when using cross-sectional

[3]In principle, it is possible to relax this assumption of exogenous wages for the revealed preference method that we introduce below, along the lines suggested by Cherchye, Demuynck, De Rock and Vermeulen (2017). For example, an alternative is to impute these post-divorce wages and incomes based on regressions that take account of the so-called marriage premium. To facilitate our exposition, we abstract from this extension in our current analysis. Moreover, for our identification method with the marital stability assumption, it can be argued that the wage rate inside marriage is probably a good benchmark when individuals compare their opportunity sets inside their current marriage and outside marriage as a single or with a different partner.

[4]As discussed in the Introduction, our use of Barten scales to represent public versus private consumption follows Browning, Chiappori and Lewbel (2013). In their theoretical discussion, these authors also considered a more general setting in which households buy the bundle v and consume the bundle x such that $v = Bx+b$, where B is a nonsingular matrix and b is a vector. We discuss this more general setting in Appendix B. Our main empirical analysis will focus on a special case of this general type of linear household technologies.

[5]For our data set, we could also have conditioned the household technology on the age and education of the wife. We have chosen not to do so because the observed marriage matchings are largely positively assortative for these individual characteristics. For example, the sample correlation between the ages of husband and wife amounts to 95%, and the correlation between education levels is 71%. See also Tables 15 and 16 in Appendix C.3.

household data (containing only a single observation per individual household). In principle, if we used a panel household data set (with a time-series of observations for each household), then we could account for unobserved heterogeneity of the household technologies as well. We will briefly return to this point in our concluding discussion in Section 8.

Economies of scale. Publicness of consumption leads to economies of scale, which represent gains from marriage. Following Browning, Chiappori and Lewbel (2013), we quantify economies of scale from living together as the ratio of the (sum of) the expenditures that the male and female would need as singles to buy their consumption bundles within marriage (i.e. public and private quantities evaluated at the observed market prices), divided by the actual (observed) outlay of the household. Formally, for each matched pair (m, f) we define the economies of scale measure

$$R_{m,f} = \frac{p_{m,f}(I + A)q_{m,f}}{y_{m,f}}. \tag{2}$$

By construction, we will have that $R_{m,f} \in [1, 2]$. If everything is consumed privately (i.e. $a_k = 0$ for all k), then $R_{m,f}$ will equal 1, which means that there are no economies of scale. At the other extreme, if all goods are consumed entirely publicly (i.e. $a_k = 1$ for all k), then $R_{m,f}$ equals 2 . If the household is characterized by both public and private consumption, then $R_{m,f}$ will be strictly between 1 and 2. Generally, our measure of scale economies quantifies a household's gains from sharing consumption. To take a specific example, let us assume that the measure equals 1.30 for some household. This means that the two individuals together would need 30% more income as singles to buy exactly the same aggregate bundle as in the household.

At this point, it is useful to remark that our scale economies measure $R_{m,f}$ is close in spirit to the popular equivalence scale concept, which aims at quantifying the cost for a household with given size and composition to achieve the same living standard as some reference household. For instance, if a single adult household needs x dollars to reach a given standard of living, and the corresponding equivalence scale for a household with two adults and one child is 2.2, then this last household needs $2.2x$ dollars to achieve the same living standard. Similar to our scale economies concept, equivalence scales capture the basic idea that households with multiple members benefit from consumption sharing. In our example, the three-member household needs less than $3x$ to reach the same standard of living as the one-member household. Equivalence scales are often used to address policy relevant questions related to poverty, inequality, the cost of children, the income compensation for spousal death or alimony rights, to name only a few.

However, the conceptual underpinnings of the equivalence scale concept are arguably very weak (see, for example, Chiappori, 2016). Most notably, it implicitly assumes that households (instead of individuals) have utilities that are comparable across household types, and it ignores the importance of intrahousehold inequality. Browning, Chiappori and Lewbel (2013) proposed the so-called indifference scale notion as a better grounded alternative to assess policy questions associated with household welfare. Indifference scales define the incomes that individuals would need to be equally well off (in utility terms) when living alone as in their current (multi-member) household. In contrast to equivalence scales, indifference scales acknowledge the fact that individuals (and not households) have utilities. In addition, they naturally account for the presence of intrahousehold inequality. We will briefly return to the computation of indifference scales by using our nonparametric methodology in the concluding Section 8.

Intrahousehold allocation. In the current paper, we will analyze intrahousehold inequality through the male m's and female f's "relative individual cost of equivalent bundle" (RICEB).[6] These measures are defined as follows:

$$R^m_{m,f} = \frac{p_{m,\phi} q^m_{m,f} + p_{m,\phi} A q_{m,f}}{y_{m,f}} \text{ and} \tag{3}$$

$$R^f_{m,f} = \frac{p_{\phi,f} q^f_{m,f} + p_{\phi,f} A q_{m,f}}{y_{m,f}}. \tag{4}$$

The interpretation is similar to the scale economies measure $R_{m,f}$. Specifically, these RICEBs capture the fractions of household expenditures that a male (female) would need as a single to achieve the same consumption level as under marriage at the new prices $p_{m,\phi}$ (resp. $p_{\phi,f}$). The RICEBs also describe the allocation of expenditures to the male and female in a given household. Given our particular setting, this allocation is defined by the household's economies of scale as well as the intrahousehold sharing pattern, which essentially reflects the individuals' bargaining positions. We will illustrate the importance of these two channels when interpreting the results for $R^m_{m,f}$ and $R^f_{m,f}$ in our empirical application.

Our RICEB measures are closely related to the sharing rule concept that is frequently used in the collective household literature. The sharing rule defines the individuals' shares of total household expenditures, and is often used as an indicator of individuals' within-household bargaining positions. In a setting with public goods, the within-household sharing rule will evaluate the publicly consumed quantities at individual-specific Lindahl prices to define the individuals' expenditure shares (see, for example, Cherchye, De Rock and Vermeulen, 2011). These Lindahl prices reflect the individuals' willingness-to-pay for public consumption, and must add up to the observed market prices. This implies a main difference with the RICEB measures $R^m_{m,f}$ and $R^f_{m,f}$ in (3) and (4), which use the market prices $p_{m,\phi}$ and $p_{\phi,f}$ for the public quantities $Aq_{m,f}$. This last feature effectively makes that our RICEB measures give the expenditures that individuals would face as singles (for the prices $p_{m,\phi}$ and $p_{\phi,f}$) when consuming the same bundles as in their current marriage. The use of market prices (instead of Lindahl prices) also implies that these measures naturally capture scale economies that are related to marriage: the sum of the individual RICEBs $R^m_{m,f}$ and $R^f_{m,f}$ may well exceed one, indicating that the total value of consumption (summed over the two household members, and evaluated at the market prices $p_{m,\phi}$ and $p_{\phi,f}$) exceeds the household expenditures

[6] Browning, Chiappori and Weiss (2014, p. 64) define the relative cost of an equivalent bundle at the couple's level, which coincides with the economies of scale measure in equation (2). We define the relative cost at the individual level, which allows us to analyze the intrahousehold allocation of resources, as we will show in our empirical application.

$y_{m,f}$.

A final issue pertains to the prices $p_{m,\phi}$ and $p_{\phi,f}$ to be used for the absent spouse's household work in case one becomes a single. In our application, we will assume that exactly the same public good produced by the absent spouse will be bought on the market. Given the earlier discussed production technology, this implies that we can use this spouse's wage as the price for the household work that serves as an input in the production process. Sometimes other options may be available, though. More detailed information on the time use of spouses, for example, would make it possible to use market prices for marketable commodities like formal child care, cleaning the house or gardening. Our current data set only contains an aggregate of the spouses' time spent on household work, which rules out such an approach. Still, as a robustness check, we have redone our following empirical analysis by using the sample averages of female and male wages (instead of the current spousal wages) to define $p_{m,\phi}$ and $p_{\phi,f}$. Reassuringly, this extra analysis yielded the same conclusions as in Sections 5 to 7 (see Appendix F.1).

3 Marital Stability

We study a marriage market that consists of a finite set of males M and a finite set of females F. The market is characterized by a matching function $\sigma : M \cup F \longrightarrow M \cup F \cup \{\phi\}$. This function tells us who is married to whom.[7] If the individual is married, then σ allocates to male m or female f a member of the opposite gender (i.e. $\sigma(m) = f$ and $\sigma(f) = m$). Alternatively, if the individual is single, then σ allocates nobody to him/her (i.e. $\sigma(m) = \phi$ and $\sigma(f) = \phi$). Obviously, m is matched to f if and only if f is matched to m, which means that the pair (m, f) is a married couple. Formally, the function σ satisfies, for all $m \in M$ and $f \in F$,

$$\sigma(m) \in F \cup \{\phi\},$$
$$\sigma(f) \in M \cup \{\phi\} \text{ and}$$
$$\sigma(m) = f \in F \text{ iff } \sigma(f) = m \in M.$$

The current study will only consider married couples, i.e. $\sigma(m) \neq \phi$ for any $m \in M$ and $\sigma(f) \neq \phi$ for any $f \in F$ (which implies $|M| = |F|$). In principle, it is relatively easy to include singles in our framework. However, our following application will show that our method gives informative results even if we do not use information on singles. Therefore, and also to simplify our exposition, we have chosen to only use couples' information in our main analysis. As a robustness check, in Appendix F.5 we show the results of an additional analysis based on a data set that also includes singles. This analysis yields results that are closely similar to the ones shown in Sections 6 and 7.

For a given matching function σ, the set $S = \{(q^m_{m,\sigma(m)}, q^{\sigma(m)}_{m,\sigma(m)}, Aq_{m,\sigma(m)})\}_{m \in M}$ represents the collection of household allocations defined over all matched pairs. In what follows, we will say

[7] In our application, marriage stands for legal marriage as well as cohabitation.

that *a matching allocation S is stable if it is Pareto efficient, individually rational and has no blocking pairs.* Essentially, this means that the allocation S belongs to the core of all possible marriage allocations. To formally define our stability criteria, we will assume that every individual i is endowed with a utility function $u^i : \mathbb{R}_+^K \longrightarrow \mathbb{R}_+$. These utility functions are individual-specific (i.e. fully unobserved heterogeneity) and egoistic in the sense that each individual is assumed to get utility only from the own private and public consumption. We further assume that the utility functions for all individuals are non-negative, increasing, continuous and concave. Finally, we make the technical assumption that $u^i(0, Aq) = 0$ (with Aq the amount of public consumption), i.e. each individual needs at least some private consumption (e.g. food) to achieve a positive utility level.

Pareto Efficiency. We assume that households make Pareto efficient decisions (following Chiappori, 1988, 1992). Pareto efficiency requires for every matched pair that the intrahousehold consumption allocation admits no Pareto improvement for the given budget constraint. In other words, there does not exist another feasible allocation that makes at least one spouse strictly better off without making the other spouse strictly worse off. Formally, the matching allocation S is Pareto efficient if, for any pair $(m, \sigma(m))$, there does not exist any other feasible allocation $(z^m, z^{\sigma(m)}, Z)$, with $p_{m,\sigma(m)}(z^m + z^{\sigma(m)} + Z) \leq y_{m,\sigma(m)}$, such that

$$u^m(z^m, Z) \geq u^m(q^m_{m,\sigma(m)}, Aq_{m,\sigma(m)}) \text{ and}$$
$$u^{\sigma(m)}(z^{\sigma(m)}, Z) \geq u^{\sigma(m)}(q^{\sigma(m)}_{m,\sigma(m)}, Aq_{m,\sigma(m)}),$$

with at least one strict inequality.

Individual rationality. Using the definition of Gale and Shapley (1962), marital stability imposes that marriage matchings satisfy the conditions of individual rationality and no blocking pairs. Individual rationality requires that no individual wants to become single. That is, no married individual can achieve a higher utility as single than under their current marriage. To formalize this criterion, let $U^m_{m,\phi}$ and $U^f_{\phi,f}$ denote that maximum utility that m and f can achieve when single (for prices $p_{m,\phi}$ and $p_{\phi,f}$ and incomes $y_{m,\phi}$ and $y_{\phi,f}$ respectively), i.e.

$$U^m_{m,\phi} = \max_{z^m, Z} u^m(z^m, Z) \text{ s.t. } p_{m,\phi}(z^m + Z) \leq y_{m,\phi} \text{ and}$$
$$U^f_{\phi,f} = \max_{z^f, Z} u^f(z^f, Z) \text{ s.t. } p_{\phi,f}(z^f + Z) \leq y_{\phi,f}.$$

Then, the matching allocation S is individually rational if, for every $m \in M$ and $f \in F$, we have

$$u^m(q^m_{m,\sigma(m)}, Aq_{m,\sigma(m)}) \geq U^m_{m,\phi} \text{ and}$$
$$u^f(q^f_{\sigma(f),f}, Aq_{\sigma(f),f}) \geq U^f_{\phi,f}.$$

No blocking pairs. An unmatched pair (m, f) is said to be a blocking one if both m and f are better off, with at least one of them strictly better off, when matched together than under their current marriages. Formally, the matching allocation S has no blocking pairs if for any m and f such that $f \neq \sigma(m)$ there does not exist any feasible allocation $(z^m_{m,f}, z^f_{m,f}, Z_{m,f})$, with $p_{m,f}(z^m_{m,f} + z^f_{m,f} + Z_{m,f}) \leq y_{m,f}$, such that

$$u^m(z^m_{m,f}, Z_{m,f}) \geq u^m(q^m_{m,\sigma(m)}, Aq_{m,\sigma(m)}) \text{ and}$$
$$u^f(z^f_{m,f}, Z_{m,f}) \geq u^f(q^f_{\sigma(f),f}, Aq_{\sigma(f),f}),$$

with at least one strict inequality.

4 Revealed Preference Conditions

In what follows, we first specify the type of data set that we will use in our following application, and we define what we mean by rationalizability by a stable matching. Subsequently, we will present our testable revealed preference conditions for a data set to be rationalizable. We will also show that these conditions can be relaxed by accounting for divorce costs (e.g. representing unobserved aspects of match quality and/or irrational behavior). Our conditions are linear in unknowns, which makes them easy to use in practice. Finally, we will indicate how our conditions enable (set) identification of households' economies of scale and intrahousehold allocation patterns.

Rationalizability by a stable matching. We observe a data set $\mathcal{D}$ on males $m \in M$ and females $f \in F$ that contains the following information:

- the matching function σ,
- the consumption bundles $(q_{m,\sigma(m)})$ for all matched couples $(m, \sigma(m))$,
- the prices $p_{m,f}$ for all $m \in M \cup \{\phi\}$ and $f \in F \cup \{\phi\}$,
- total nonlabor incomes $n_{m,\sigma(m)}$ for all matched couples $(m, \sigma(m))$.

Obviously, to verify if a given marriage allocation is stable or not, the analyst needs to know who is married to whom (σ). Next, we observe the aggregate consumption demand $(q_{m,\sigma(m)})$ of the matched pairs $(m, \sigma(m))$ but not the associated intrahousehold allocation of this consumption. Similarly, we do not observe the aggregate consumption demand of the unmatched pairs (m, f) (with $f \neq \sigma(m)$). In our following conditions, we will treat the vector $q_{m,f}$ for $f \neq \sigma(m)$ as an unknown variable representing the potential consumption of (m, f). By contrast, we observe the prices for all decision situations, i.e. for observed marriages but also for unobserved singles and unobserved potential couples. We recall from Section 2 that the quantity vectors $q_{m,f}$ contain a Hicksian aggregate good and time spent on leisure as well as on household production and, correspondingly, the price vectors $p_{m,f}$ contain the price of the aggregate good (which we normalize at unity) and individual wages. Finally, for the observed/married couples $(m, \sigma(m))$ we use a consumption-based measure of total nonlabor income, i.e. nonlabor income equals reported consumption expenditures minus full income. Then, we treat individual nonlabor incomes as unknowns that are subject to the restriction that they must add up to the observed (consumption-based) total nonlabor income, i.e.

$$n_{m,\sigma(m)} = n_m + n_{\sigma(m)},$$

and, for a given specification of the individual incomes n_m and $n_{\sigma(m)}$, we obtain the full incomes $y_{m,f}$, $y_{m,\phi}$ and $y_{\phi,f}$ as in (1).

We say that *the data set $\mathcal{D}$ is rationalizable by a stable matching if there exist nonlabor incomes n_m and n_f (defining $y_{m,f}$, $y_{m,\phi}$ and $y_{\phi,f}$), utility functions u^m and u^f, a $K \times K$ diagonal matrix A (with diagonal entries $0 \leq a_k \leq 1$) and individual quantities $q^m_{m,\sigma(m)}, q^{\sigma(m)}_{m,\sigma(m)} \in \mathbb{R}^K_+$, with*

$$q^m_{m,\sigma(m)} + q^{\sigma(m)}_{m,\sigma(m)} = (I - A)q_{m,\sigma(m)},$$

such that the matching allocation $\{(q^m_{m,\sigma(m)}, q^{\sigma(m)}_{m,\sigma(m)}, Aq_{m,\sigma(m)})\}_{m \in M}$ is stable. As discussed in the previous section, stability means that we can represent the observed consumption and marriage behavior as Pareto efficient, individually rational and without blocking pairs for some specification of the individual utilities and household technologies (i.e. Barten scales).

Testable implications. We can now define testable conditions for rationalizability by a stable matching. The main innovative feature of our current set-up is that we consider that the public consumption of the matched couples could be represented by an unknown technology matrix A defining the public versus private nature of household expenditures. As motivated in the Introduction, this specific extension is particularly attractive from a practical perspective, as it opens the possibility to study data sets in which the public and private nature of household expenditures is unknown and/or hard to define.

Our testable conditions only use information that is contained in the data set $\mathcal{D}$ and do not require any (non-verifiable) functional structure on the within-household decision process, which minimizes the risk of specification error. In addition, the conditions avoid any preference homogeneity assumption for individuals in different households. Moreover, they use only a single consumption observation per household, which makes them applicable to cross-sectional household data sets. The conditions are stated in the next result. (The proof of the result is given in Appendix A.)

Proposition 1 *The data set $\mathcal{D}$ is* rationalizable by a stable matching *only if there exists a $K \times K$ diagonal matrix A with diagonal entries $0 \leq a_k \leq 1$ (for all $k \in \{1, 2, \cdots, K\}$) and, for each matched pair $(m, \sigma(m))$,* *(a) nonlabor incomes* n_m, $n_{\sigma(m)} \in \mathbb{R}$ *with*

$$n_{m,\sigma(m)} = n_m + n_{\sigma(m)}$$

(b) and individual quantities $q^m_{m,\sigma(m)}, q^{\sigma(m)}_{m,\sigma(m)} \in \mathbb{R}^K_+$ *with*

$$q^m_{m,\sigma(m)} + q^{\sigma(m)}_{m,\sigma(m)} = (I - A)q_{m,\sigma(m)},$$

that meet, for all males $m \in M$ *and females* $f \in F$,

(i) the individual rationality restrictions

$$(y_{m,\phi} =) \;\; w_m T + n_m \leq p_{m,\phi} q^m_{m,\sigma(m)} + p_{m,\phi} A q_{m,\sigma(m)} \;\; \textit{and}$$
$$(y_{\phi,f} =) \;\; w_f T + n_f \leq p_{\phi,f} q^f_{\sigma(f),f} + p_{\phi,f} A q_{\sigma(f),f},$$

(ii) and the no blocking pair restrictions

$$(y_{m,f} =) \;\; w_m T + w_f T + n_m + n_f \leq p_{m,f}\left(q^m_{m,\sigma(m)} + q^f_{\sigma(f),f}\right) + p_{m,f} A \max\{q_{m,\sigma(m)}, q_{\sigma(f),f}\}.$$

Interestingly, the testable implications in Proposition 1 are linear in the unknown technology matrix A, the nonlabor incomes n_m and $n_{\sigma(m)}$, and the individual quantities $q^m_{m,\sigma(m)}$ and $q^{\sigma(m)}_{m,\sigma(m)}$. This makes it easy to verify them in practice. The explanation of the different conditions is as follows. First, the proposition requires the construction of a technology matrix A of which the diagonal entries capture the degree of publicness in each consumption good, ranging from entirely private ($a_k = 0$) to entirely public ($a_k = 1$). Next, conditions (a) and (b) specify the adding up restrictions for matched couples that we discussed above, which pertain to the unknown individual nonlabor incomes and privately consumed quantities.

Further, conditions (i) and (ii) impose the individual rationality and no blocking pair restrictions that apply to a stable marriage allocation. They have intuitive revealed preference interpretations. More specifically, condition (i) requires, for each individual male and female, that the total income and prices faced under single status (i.e. $y_{m,\phi}$ and $p_{m,\phi}$ for male m and $p_{\phi,f}$ and $y_{\phi,f}$ for female f) cannot afford a bundle that is strictly more expensive than the one consumed under the current marriage (i.e. $\left(q^m_{m,\sigma(m)}, Aq_{m,\sigma(m)}\right)$ for m and $\left(q^f_{\sigma(f),f}, Aq_{\sigma(f),f}\right)$ for f). Indeed, if this condition were not satisfied for some individual, then he or she would be strictly better off as a single. Similarly, condition (ii) imposes, for each potentially blocking (i.e. currently unmatched) pair (m, f), that the total income ($y_{m,f}$) and prices ($p_{m,f}$) cannot afford a bundle that is strictly more expensive than the sum of the individuals' private bundles (i.e. $q^m_{m,\sigma(m)} + q^f_{\sigma(f),f}$) and the public bundle that is composed of the highest quantities consumed in the current marriages (which is defined as $A\max\{q_{m,\sigma(m)}, q_{\sigma(f),f}\}$).[8] Intuitively, if this condition is not met, then man m and woman f can

[8]The expression $\max\{q_{m,\sigma(m)}, q_{\sigma(f),f}\}$ represents the element-by-element maximum, i.e. $q = \max\{q^1, q^2\}$ indicates

allocate their joint income so that they are both better off (with at least one strictly better off) than with their current partners.

Divorce Costs. So far, we have assumed that marriage decisions are only driven by material payoffs captured by the individual consumption bundles $\left(q^m_{m,\sigma(m)}, Aq_{m,\sigma(m)}\right)$ for males m and $\left(q^f_{\sigma(f),f}, Aq_{\sigma(f),f}\right)$ for females f. Implicitly, we assumed that individuals are perfectly rational in their consumption and marriage behavior, and that there are no gains from marriage originating from unobserved match quality (such as love or companionship). We have also abstracted from frictions on the marriage market and costs associated with marriage formation and dissolution.

In our empirical application, we will follow Cherchye, Demuynck, De Rock and Vermeulen (2017) and include the possibility that these different aspects may give rise to costs of divorce, which makes that the observed consumption behavior (captured by the observed data set $\mathcal{D}$) may violate the strict rationality requirements in Proposition 1. In particular, we make use of "stability indices" to weaken these strict constraints. Intuitively, these indices represent income losses associated with the different exit options from marriage (i.e. becoming single or remarrying a different partner). We represent these post-divorce losses as percentages of potential labor incomes.[9] Alternatively, these indices can also be interpreted as quantifying how close the observed household behavior is to "exactly stable" behavior as characterized by the conditions in Proposition 1; they allow us to account for deviations from such exact stability in the empirical analysis. In that sense, the stability indices are similar in spirit to the nonparametric "goodness-of-fit" indices (interchangeably referred to as Critical Cost Efficiency Indices and Afriat Indices in the literature) that Afriat (1972, 1973) and Varian (1990) proposed in the context of revealed preference analysis of demand.

Formally, starting from our characterization in Proposition 1, we include a stability index in each restriction of individual rationality (i.e. $s^{IR}_{m,\phi}$ for male m and $s^{IR}_{\phi,f}$ for female f) and no blocking pair (i.e. $s^{NBP}_{m,f}$ for the pair (m,f)). Specifically, we replace the inequalities in condition (i) of Proposition 1 by

$$s^{IR}_{m,\phi} \times w_m T + n_m \leq p_{m,\phi} q^m_{m,\sigma(m)} + p_{m,\phi} A q_{m,\sigma(m)} \text{ and} \qquad (5)$$
$$s^{IR}_{\phi,f} \times w_f T + n_f \leq p_{\phi,f} q^f_{\sigma(f),f} + p_{\phi,f} A q_{\sigma(f),f},$$

and the inequality in condition (ii) of Proposition 1 by

$$s^{NBP}_{m,f} \times (w_m T + w_f T) + n_m + n_f \leq p_{m,f} q^m_{m,\sigma(m)} + p_{m,f} q^f_{\sigma(f),f} + p_{m,f} A \max\{q_{m,\sigma(m)}, q_{\sigma(f),f}\}. \quad (6)$$

We also add the restriction $0 \leq s^{IR}_{m,\phi}, s^{IR}_{\phi,f}, s^{NBP}_{m,f} \leq 1$. Generally, a lower stability index corresponds to a greater income loss associated with a particular option to exit marriage.

$q_k = \max\{q^1_k, q^2_k\}$ for all goods k.

[9] We consider adjustment in labor incomes because nonlabor incomes are unknown variables in our conditions in Proposition 1. By only considering post-divorce adjustments of labor incomes, we preserve linearity in unknowns when treating the stability indices as unknown variables. This enables us to use linear programming to compute these indices (see our following discussion of (7)).

Then, we can compute

$$\max \sum_{m\in M} s^{IR}_{m,\phi} + \sum_{f\in F} s^{IR}_{\phi,f} + \sum_{m\in M, f\in F} s^{NBP}_{m,f} \tag{7}$$

subject to the feasibility conditions for the technology matrix A, the restrictions (a) and (b) in Proposition 1, and the linear constraints (5) and (6). This simple linear program allows to compute a different stability index for every individual rationality constraint (i.e. $s^{IR}_{m,\phi}$ and $s^{IR}_{\phi,f}$) and no blocking pair constraint (i.e. $s^{NBP}_{m,f}$). Intuitively, for each different exit option, it defines a minimal divorce cost that is needed to rationalize the observed marriage behavior by a stable matching allocation. These post-divorce income losses equal $(1 - s^{IR}_{m,\phi}) \times 100$ and $(1 - s^{IR}_{\phi,f}) \times 100$ for each exit option to become single and, similarly, $(1 - s^{NBP}_{m,f}) \times 100$ for every remarriage option.

Set identification. To address identification, we first need to check whether the data set satisfies the testable restrictions in Proposition 1. We do so by solving the above discussed linear program with objective (7). If this program yields a solution value of one for all stability indices $s^{IR}_{m,\phi}$, $s^{IR}_{\phi,f}$ and $s^{NBP}_{m,f}$, we conclude that the observed consumption behavior satisfies our strict requirements for marital stability. In the other case, the program calculates minimal divorce costs (captured by the indices $s^{IR}_{m,\phi}$, $s^{IR}_{\phi,f}$ and $s^{NBP}_{m,f}$) that are required to rationalize the observed behavior by a stable matching allocation. In our application, we will use the computed values of $s^{IR}_{m,\phi}$, $s^{IR}_{\phi,f}$ and $s^{NBP}_{m,f}$ to rescale the original potential labor incomes ($w_m T$, $w_f T$ and $w_m T + w_f T$), which will define an adjusted data set that is rationalizable by a stable matching. For this new data set, we can address alternative identification questions by starting from our rationalizability conditions.

In the following sections, we will specifically focus on the scale economies measure $R_{m,f}$ in (2) and the associated RICEB measures $R^m_{m,f}$ in (3) and $R^f_{m,f}$ in (4). Particularly, we obtain "set" identification by defining upper and lower bounds for these measures subject to our maintained assumption of marital stability; these bounds define intervals of feasible values for the measures that are compatible with our rationalizability restrictions. From an operational perspective, an attractive feature of the measures $R_{m,f}$, $R^m_{m,f}$ and $R^f_{m,f}$ is that they are also linear in the unknown matrix A and individual quantities $q^m_{m,\sigma(m)}$ and $q^{\sigma(m)}_{m,\sigma(m)}$. As a result, we obtain our upper/lower bounds for these measures by maximizing/minimizing these linear functions subject to our linear rationalizability restrictions in Proposition 1. This effectively set identifies the households' economies of scale and intrahousehold allocation patterns, through linear programming. This set identification essentially only exploits marital stability as our key identifying assumption, without any further parametric structure for intrahousehold decision processes or homogeneity assumptions regarding individual preferences.

As a final remark, we note that the stability indices may also be seen as indicating an incentive to divorce. In that reasoning, divorce costs signal unstable marriages, which makes the assumption of marriage stability useless for the identification of intrahousehold decision processes. In our following empirical analysis, we will account for this concern by performing a robustness check, in which the empirical identification analysis only includes couples that do not require a divorce cost for any exit option to rationalize the observed household consumption. See our discussion at the end of Section 5 (and the empirical results in Appendix F.2).

5 Empirical Application: Set-up

We consider households that spend their full income (i.e. potential labor income and nonlabor income) on a Hicksian aggregate market good, time for household production and time for leisure. Our data set includes information on individuals' time use for household work and for leisure. Apps and Rees (1997) and Donni (2008) have emphasized the importance of considering home production for identifying intrahousehold allocations and conducting individual welfare analysis. Particularly, ignoring time spent on household production means that all time not spent on market labor will be considered as pure leisure. In such a case, an individual with low market labor supply (e.g. a part-time working mother) will be regarded as consuming a lot of leisure, even if in fact (s)he spends a large amount of time on home production (e.g. child care). In our model, we only associate (potential) economies of scale with consumption goods that have market substitutes; these scale economies can effectively be compensated in case of spousal death or marriage dissolution. As an implication, we allow the Hicksian market good and time spent on household production to be characterized by a public component, while time spent on leisure is modeled as purely private.[10]

Data. We use household data drawn from the 2013 wave of the Panel Study of Income Dynamics (PSID). The PSID data collection began in 1968 with a nationally representative sample of over 18,000 individuals living in 5,000 families in the United States. The data set contains a rich set of information on households' labor supply, income, wealth, health and other sociodemographic variables. From 1999 onward, the panel data is supplemented by detailed information on households' consumption expenditures. The 2013 wave includes data on 9063 households.

In our empirical analysis, we focus on couples with or without children and no other family member living in the household. Because we need wage information, we only consider households in which both spouses work at least 10 hours per week on the labor market.[11] After removing observations with missing information (e.g. on time use) and outliers, we end up with a sample of

[10] As a further robustness check, we also consider the scenario in which a fraction of leisure is allowed to be publicly consumed (reflecting externalities). Specifically, instead of assuming that all leisure is privately consumed, we now put upper bounds of 5, 10 and 15% on the degree of publicness of male and female leisure (i.e. we set $A_{leisure} \leq 5\%, 10\%$ and 15%). Evidently, because this allows for more public consumption, our scale economies estimates and individual RICEBs generally increase, by construction. However, and importantly, the main qualitative conclusions of our regression exercises (reported in Tables 5 and 8) remain intact. These results are discussed in Appendix F.3.

[11] We see two possible approaches to account for spouses who are not active on the labor market. Firstly, we could exogenously define the wage of the inactive spouses on the basis of their observable characteristics (like education and age). Secondly, we could use the method of Cherchye, De Rock, Vermeulen and Walther (2017), and define shadow prices endogenously under the assumption of efficient household production and constant returns-to-scale. To simplify our discussion, we chose not to follow these approaches in the current paper. But the extensions are fairly easy.

1322 households.[12]

Table 1 provides summary information on the households that we consider. Wages are hourly wage rates, and market work, household work and leisure are expressed in hours per week. We compute leisure quantities by assuming that each individual needs 8 hours per day for sleep and personal care (i.e. leisure = (24-8)*7 - market work - household work). Consumption stands for dollars per week spent on market goods. We compute the quantity of this good as the sum of household expenditures on food, housing, transport, education, child care, health care, clothing and recreation.[13] Appendices C.1 and C.4 give additional details on our variable definitions and household data (see Tables 17-20).

To implement the rationalizability restrictions in Proposition 1, we need to define the prices and incomes that apply to the different exit options from marriage (becoming single or remarrying). In what follows, the price of individuals' time use (leisure and household work) equals their wage rate, and we will assume that wages are unaffected by marital status. This implies that we can use the observed wages as the price of own time use in any counterfactual situation. Next, for spousal household work, we use the wage rate of the potential spouse when evaluating the exit option of remarriage (in the no blocking pair restrictions) and the wage rate of the current spouse when evaluating the exit option of becoming single (in the individual rationality restrictions).[14] Further, we set the price of the Hicksian market good equal to one in all counterfactual scenarios. Finally, we need to define the individuals' potential labor and nonlabor incomes to construct full potential incomes that correspond to the alternative post-divorce scenarios. Using our assumption that labor productivity is independent of marital status, we obtain individuals' maximal labor incomes for any exit option as total available time (i.e. (24-8)*7 = 112 hours per week) multiplied by their wage rates. Next, as discussed in Section 4, we treat the individuals' nonlabor post-divorce incomes as unknowns in our rationalizability restrictions. Following Cherchye, Demuynck, De Rock and Vermeulen (2017), we exclude unrealistic scenarios by imposing that individual nonlabor incomes after divorce must lie between 40% and 60% of the total nonlabor income under marriage.

Marriage markets. As indicated above, we let household technologies vary with observable household characteristics (i.e. age, education, number of children and region of residence). We use

[12] We dropped 4429 households with an unmarried head of family. 2640 households were not considered because of missing information (mainly on individuals' education, time use and wages) and another 617 households had household members different from husband, wife and children. Finally, we lost 55 households because of data trimming (leaving out the households in the 1st and 99th percentiles of the male and female wage distributions).

[13] We do not observe intraregional price variation for food, house, transport, education, child care, health care, clothing and recreation in our original PSID data set. As we will explain further on, we will consider testable implications of our household consumption model for marriage markets defined at the regional level. Therefore, there is no value added of disaggregating our Hicksian market good for our empirical analysis.

[14] Cherchye, De Rock, Demuynck and Vermeulen (2017) used similar assumptions to define the price of leisure in their empirical application. As these authors point out, an alternative possibility is to impute the counterfactual wages and incomes for the different exit options (e.g. based on reduced-form analysis). For time spent on household work, another alternative option is to use the prices of marketable commodities like formal child care, cleaning the house and gardening. By lack of detailed information on the spouses' time use, we do not follow this route in the paper. However, in Appendix F.1 we report on a robustness check in which we use the average wage of males and females in the sample to evaluate spousal domestic work in the counterfactual situation of singlehood.

	Mean	Std. dev.	Min	Max
Wage male	30.38	20.73	3.38	144.93
Wage female	23.78	15.07	2.66	96.94
Market work male	44.93	10.78	10	100
Market work female	37.90	11.34	10	96
Household work male	7.46	6.26	0	50
Household work female	13.29	9.58	0	77
Leisure male	59.61	12.11	0	99
Leisure female	60.81	12.37	0	97
Age male	40.78	11.83	20	82
Age female	39.02	11.62	19	77
Children	1.14	1.21	0	7
Consumption	1209.55	557.41	250.12	5375

Table 1: Sample summary statistics

the same observable characteristics to define households' marriage markets. As an implication, while our analysis accounts for fully (unobservably) heterogeneous individual preferences (as explained before), we do consider that all potential couples on the same marriage market are characterized by a homogeneous consumption technology (defining the public versus private nature of goods). Thus, we specifically focus on marriage matchings on the basis of individuals' preferences for the public and private goods that are consumed within the households, and we build on this premise to learn about the underlying household technology from the observed marriage matchings.

Evidently, in real life individuals may well account for remarriage possibilities that are characterized by different technologies (for different household characteristics). In addition, they may also consider repartnering with other individuals who are currently single. Including information on these additional repartnering options would increase the number of potentially blocking pairs, and this can only improve our identification analysis.[15] From this perspective, our following empirical analysis adopts a "conservative" approach and only uses largely uncontroversial assumptions on individuals' remarriage options. We will show that even this minimalistic set-up leads to insightful empirical conclusions.

We construct our marriage markets on the basis of four observable dimensions: age, education, number of children and region of residence. We condition on age and education because there is plenty of empirical evidence in the literature that spouses match assortatively on these characteristics. This observation also applies to our data set, as we illustrate in Tables 15 and 16 in Appendix C.3. It seems very reasonable to assume that individuals with a similar age and education level consider each other as potential partners. Given the high level of assortativeness, we will define our marriage markets (solely) on the basis of the age and education levels of the husband.[16] Next, the

[15]Technically, including additional blocking pair constraints will lead to smaller feasible sets characterized by the rationalizability constraints in Proposition 1. In turn, this will lead to sharper upper and lower bounds (i.e. tighter set identification). We illustrate this point in Appendix F.5, which presents a robustness analysis in which we also include singles to define potentially blocking pairs.

[16]A convenient side product is that this also weakens our data requirement. For about 15 percent of the households

fact that we control for the number of children follows naturally from our assumption that couples in the same marriage market are characterized by a homogeneous consumption technology. Finally, we only consider potential remarriages in the same region of residence to account for the possibility of geographically restricted marriage markets.

Concretely, we have partitioned our sample of households in 160 different marriage markets. The partitioning is based on a categorical variable for the age group of the husband (i.e. below 30 years, between 31 and 40 years, between 41 and 50 years, between 51 and 60 years or at least 61 years), a dummy variable indicating whether the husband has a college degree or not, a categorical variable for the number of children that live in the household (i.e. 0, 1, 2 or at least 3 children), and a categorical variable indicating the region of residence (i.e. Northeast, North Central, South or West). We observe no households for 32 of the 160 marriage markets. We applied our revealed preference methodology outlined in Section 4 to each of the remaining 128 markets. Marriage market sizes range from 1 to 39 household observations, with an average of 10.33 observations per market. See Tables 11-14 in Appendix C.2 for more detailed information.[17]

Two concluding notes are in order. Firstly, by restricting the individuals' marriage markets to only contain potential partners with similar observable characteristics as their current partners, we effectively control for differences in match quality that are driven by these characteristics.[18] From this perspective, the divorce costs that we will compute further on (see Table 2) can be interpreted in terms of residual differences in match quality that are defined by unobservable individual characteristics. Interestingly, we will find that these divorce costs are generally low, which seems to support this interpretation.

Secondly, even though we focus on small marriage markets containing observationally similar households, it may well be argued that in practice the individuals in our sample do not know all the individuals of the other gender in the same market. In this respect, we remark that our analysis does not need that each individual in our sample effectively observes all these other individuals. It suffices that (s)he knows at least one individual who is of the same type as each other observed individual (and who is considered as a remarriage option to form a potentially blocking pair). Next, to check sensitivity of our results with respect to this observability assumption, we have redone our following exercises (reported in the next two Sections) to 10) under the weaker assumption that individuals consider a non-random subsample (based on a rich/poor categorization) of other individuals in the marriage market as potential partners. The results of this exercise are reported in Appendix F.4; they are similar to the findings of our main analysis. As an additional robustness check, we have considered a scenario where individuals consider only 50% (instead of 100%) of the possible partners of the other gender. In this case, we randomly subsampled from the individuals' marriage markets as defined above, and we based our identification analysis on the average of

in our sample, we do do not observe the education level of the female.

[17]From Appendix C.2, we observe that there are 15 marriage markets with a single household observation. In these cases, the identification of household technologies is completely driven by the individual rationality restrictions in Proposition 1.

[18]For example, the literature on "who marries whom and why" (after Choo and Siow, 2006) has identified (differences in) age and education levels as important (observable) determinants of marital surplus.

the resulting (upper and lower bound) estimates for our scale economies and RICEB measures. Again, our main qualitative findings remain unaffected. For compactness, we will not discuss these additional results in the current paper, but they are available upon request. We will briefly return to the issue of defining marriage markets in the concluding section.

Divorce costs. When checking the strict rationalizability conditions in Proposition 1, we found that our data satisfy these conditions for 69 out of the 128 marriage markets. For the remaining 59 markets, we computed the divorce costs that we need to rationalize the observed consumption and marriage behavior. As explained in Section 4, for each different exit option (i.e. becoming single or remarrying) this computes a minimal divorce cost that makes the observed data set consistent with the sharp restrictions in Proposition 1. These divorce costs can be interpreted in terms of unobserved aspects that drive (re)marriage decisions, such as imperfect rationality, match quality and frictions on the marriage markets.

Table 2 summarizes our results. The second and third column show the divorce costs pertaining to the individual rationality conditions of the males and the females in our sample. The fourth and fifth column relate to the no blocking pair restrictions. For a matched pair $(m, \sigma(m))$, Average cost stands for the average divorce cost defined over all remarriage options taken up in our analysis (i.e. the mean of the values $(1 - s_{m,f'}^{NBP}) \times 100$ and $(1 - s_{m',\sigma(m)}^{NBP}) \times 100$ over all f' and m'), and Maximum cost for the highest divorce cost necessary to neutralize all possible remarriages (i.e. the maximum of the values $(1 - s_{m,f'}^{NBP}) \times 100$ and $(1 - s_{m',\sigma(m)}^{NBP}) \times 100$ over all f' and m'). Intuitively, the Average divorce cost pertains to the "average" remarriage option (in terms of material consumption possibilities), while the Maximum divorce cost is defined by the "most attractive" remarriage option.

We observe that about 87% of the males and 98% of the females in our sample satisfy the strict individual rationality conditions (i.e. the associated divorce costs are zero). Next, the mean divorce costs for these individual rationality restrictions equal no more than 0.36% for the males and 0.05% for the females. These results suggest that very few males and even fewer females have an incentive to become single. Given our particular set-up, a natural explanation is that the observed marriages are characterized by economies of scale, which is what we investigate in the following Section 6. However, some individuals need a relatively high divorce cost to rationalize their behavior. For instance, the maximum values in Table 2 reveal that individual rationality requires a cost of becoming single that amounts to no less than 14.74% for at least one male and 10.47% for at least one female.[19]

Further, we see that almost 66% of the married couples in our sample are stable in terms of the no blocking pair restrictions. Similar to before, the mean values for the Average and Maximum costs are fairly low (i.e. 0.06% for the Average divorce cost and 1.12% for the Maximum divorce cost). Once more, the maximum values (i.e. 3.82% for the males and 11.96% for the females) show that we need a rather significant divorce cost to rationalize the marriage behavior of some couples.

Summarizing, the results in Table 2 suggest that, for the large majority of households, we need

[19] In Appendix D.2 we relate this observed heterogeneity in divorce costs to observable household characteristics.

only to mildly adjust the post-divorce incomes to rationalize the observed consumption behavior in terms of a stable matching allocation. Nevertheless, it may be argued that divorce costs effectively signal unstable marriages, which thus cannot be used to learn about intrahousehold decision processes (by using stability of marriage as an identifying assumption). Therefore, as an additional robustness check, we have also conducted our following identification analysis for the subsample of couples that do not require a divorce cost for any exit option to rationalize the observed consumption and marriage behavior. This criterion led us to drop 480 couples (i.e. about 36 percent of our sample), and we redid our main empirical exercises for the remaining 842 "exactly stable" households. Comfortingly, we again find that our main conclusions regarding households' scale economies and intrahousehold allocations remain intact when only considering this smaller set of households. The results are discussed in Appendix F.2.

	Individual Rationality		No Blocking Pairs	
	Male	Female	Average	Maximum
Fraction of zeros	86.54	98.64	65.66	65.66
Mean	0.36	0.05	0.06	1.12
Std. dev.	1.37	0.54	0.22	2.24
Min	0.00	0.00	0.00	0.00
1t quartile	0.00	0.00	0.00	0.00
Median	0.00	0.00	0.00	0.00
3rd quartile	0.00	0.00	0.04	1.33
Max	14.74	10.47	3.82	11.96

Table 2: Divorce costs as a fraction of post-divorce income (in %)

6 Economies of Scale

By using the divorce costs summarized in Table 2, we can construct a new data set that is rationalizable by a stable matching. In turn, this allows us to set identify the decision structure underlying the observed stable marriage behavior. We begin by considering the upper and lower bound estimates for the scale economies measure $R_{m,f}$ in (2). In doing so, we will also consider the associated good-specific Barten scales (i.e. the diagonal entries of the household technology matrix A). In our application, these Barten scales capture the degree of publicness of spouses' household work and couples' consumption of market goods. We will end this section by conducting a regression analysis that relates our scale economies estimates to observable household characteristics.

Identification results. As a first step, we compare our estimated upper and lower bounds with so-called "naive" bounds. These naive bounds do not make use of the (theoretical) restrictions associated with the assumption that marriage markets are stable. In this respect, we remark that the sole assumption of Pareto efficient intrahousehold allocations (without marital stability) imposes no empirical restriction on observed household consumption when allowing for fully heterogeneous individual preferences (see Cherchye, Demuynck, De Rock and Vermeulen, 2017). More specifically, the naive bounds are defined as follows. The lower bound corresponds to a situation in which A equals the zero matrix, which means that there is no public consumption at all. By contrast, the naive upper bound complies with the other extreme scenario in which spouses' household work and market goods are entirely publicly consumed, which corresponds to a value of unity for the diagonal elements of the matrix A. Note that the private consumption of leisure implies that this upper bound will in general be different from two, which would be the upper bound in case all commodities are purely publicly consumed. In what follows, we call the bounds that we obtain by our methodology "stable" bounds, as they correspond to a stable matching allocation on the marriage market. Comparing these stable bounds with the naive bounds will provide insight into the identifying power of our key identifying assumption, that is, stability of observed marriages.

The results of this comparison are summarized in Table 3.[20] Columns 2-4 describe the bounds for $R_{m,f}$ that we estimate by our method, and columns 5-7 report on the associated naive bounds. We also give summary statistics on the percentage point differences between the (stable and naive) upper and lower bounds (see the "Difference" columns); these differences indicate the tightness of the bounds for the different households in our sample. To interpret these results, we recall that leisure is assumed to be fully privately consumed. However, as extensively discussed above, we do not impose any assumption regarding the public or private nature of the remaining expenditure categories (i.e. household work and market goods). Even under our minimalistic set-up, our identification method does yield informative results. Specifically, the average lower bound on $R_{m,f}$ equals 1.06 while the upper bound amounts to 1.18, corresponding to an average difference of only 12 percentage points. Importantly, these stable bounds are substantially tighter than the naive bounds. The naive lower bound is 1.00 by construction and the upper bound equals 1.36 on average, which implies a difference of no less than 36 percentage points. Moreover, for 50% of the observed households we obtain a difference of less than 3 percentage points, which is substantially tighter than for the naive bounds.

	Stable			Naive		
	Min	Max	Difference	Min	Max	Difference
Mean	1.06	1.18	0.12	1.00	1.36	0.36
Std. dev.	0.06	0.12	0.15	0.00	0.11	0.11
Min	1.00	1.00	0.00	1.00	1.10	0.10
25%	1.00	1.09	0.00	1.00	1.29	0.29
50%	1.04	1.15	0.03	1.00	1.35	0.35
75%	1.10	1.25	0.24	1.00	1.43	0.43
Max	1.33	1.71	0.71	1.00	1.79	0.79

Table 3: Economies of scale

As a following exercise, Table 4 reports on our estimates of the diagonal entries a_k (for each good k) of the technology matrix A that underlies the scale economies results in Table 3. For the spouses' household work and the Hicksian market good, the "Min" columns 2, 5 and 8 correspond

[20] Appendix D.1 shows the empirical cumulative distribution of the stable upper and lower bounds on our scale economies measure $R_{m,f}$.

to the lower stable bounds in Table 3, the "Max" columns 3, 6 and 9 to the upper stable bounds, and the "Avg" columns 4, 7 and 10 to the average of the Min and Max estimates. We note that the associated "naive" estimates of the a_k-entries (underlying the naive bounds in Table 3) trivially equal 0 for the minimum scenario and 1 for the maximum scenario, by construction.

Table 4 again shows the informative nature of the bounds that we obtain. On average, there seems to be some difference in publicness of household work by females or by males: the respective lower bounds equal 0.25 and 0.14, and the associated upper bounds amount to 0.51 and 0.38. Interestingly, our results do reveal quite some variation across households: in some households all household work is privately consumed (i.e. the minimum value for the upper bound on a_k equals 0), while in other households the consumption is fully public (i.e. the maximum value for the lower bound on a_k equals 1).

Next, we find that the average a_k-estimate for the Hicksian market good is situated between 0.15 (lower bound) and 0.47 (upper bound), which implies that the Barten scale for market goods (defined as $1+a_k$) is situated between 1.15 and 1.47. These estimates are reasonably close to other estimates that have been reported in the literature (for different household samples, without leisure and using a parametric methodology), thus providing external validation for the results obtained through our novel method. For example, Browning, Chiappori and Lewbel (2013) measure scale economies for Canadian households that correspond to an average Barten scale of 1.52 for market goods, and Cherchye, De Rock and Vermeulen (2012) compute an average Barten scale that equals 1.38 for the market consumption of Dutch elderly couples. Once more, we observe quite some heterogeneity in the a_k-estimates across households (ranging from a minimum value for the upper bound of 0 to a maximum value for the lower bound of 0.66).

	House work by female			House work by male			Market good		
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Mean	0.25	0.51	0.38	0.14	0.38	0.26	0.15	0.47	0.31
Std. dev.	0.31	0.39	0.28	0.25	0.41	0.26	0.17	0.30	0.15
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25%	0.00	0.16	0.16	0.00	0.00	0.00	0.00	0.26	0.19
50%	0.12	0.46	0.41	0.00	0.25	0.25	0.05	0.40	0.32
75%	0.42	0.98	0.50	0.25	0.90	0.50	0.31	0.69	0.43
Max	1.00	1.00	1.00	1.00	1.00	1.00	0.66	1.00	0.68

Table 4: Degree of publicness

Interhousehold heterogeneity. The results in Tables 3 and 4 show the potential of our identification method to obtain informative results, even if we make minimal assumptions regarding the data at hand. Moreover, our findings reveal quite some interhousehold heterogeneity in the patterns of scale economies. We investigate this further by relating the estimates summarized in Table 3 to observable household characteristics. This should provide additional insight into which household types are particularly characterized by higher or lower economies of scale. Admittedly, our following regression analysis will be mainly explorative and of the reduced form type. Still, we will be able to give the estimated effects a structural interpretation in terms of the underlying marital matching mechanics. Also, the fact that we obtain intuitively plausible results gives additional validation to the empirical usefulness of our identification method.

Specifically, we conduct two regression exercises: our first exercise uses interval regression and explicitly takes the (difference between) lower and upper bounds into account, while our second exercise is a simple OLS regression that uses the average of the lower and upper bounds as the dependent variable. Interestingly, the results of the two regressions will be very similar, which we believe supports the robustness of our conclusions. Our findings are summarized in Table 5. Appendix D.3 reports the complementary results for the diagonal entries of the A matrix summarized in Table 4.[21]

We observe that quite many observable household characteristics correlate significantly with our scale economies estimates.[22] Generally, it appears that poorer households consume more publicly than richer households with similar characteristics. But the intrahousehold distribution of the labor income (measured by the wage ratio) does not seem to relate to a household's scale economies. In terms of the underlying matching model, it suggests that poorer households need to invest more in public consumption to obtain a stable household allocation. More specifically, the results in Table 22 in Appendix D.3 show that lower income households are generally characterized by a higher degree of publicness of the Hicksian good, whereas we find no significant relationship between publicness of the spouses' household work and the household's full income.

Next, we learn that couples with dependent children are generally characterized by higher economies of scale than couples without children. This reveals that the presence of children boosts the publicness of household work and household consumption, which conforms to our intuition. From Table 22 in Appendix D.3, we learn that it is publicness of the Hicksian good and household work by the female that typically generates these higher scale economies associated with having children. By contrast, publicness of household work by the male seems to be mostly negatively related with the presence of children.

Further, we find that the publicness of household consumption varies with the age structure, all else equal. Lastly, we find evidence that households located in the North Central and South regions experience systematically less scale economies than households in the Northeast region. One possible explanation is that residing in the Northeast is associated with a higher cost-of-living

[21] We have also explored the relation between, on the one hand, estimated economies of scale as captured by publicness in Hicksian consumption and, on the other hand, the individual components of our Hicksian good (food, housing, transport, education, child care, health care, clothing and recreation). Particularly, we redid the Hicksian good regression reported in Table 22 in Appendix D.3, but now including the budget shares of these components as additional explanatory variables. This additional exercise did not reveal any significant relation between these budget shares and our estimates of the degree of publicness in Hicksian consumption (results available upon request). Using relative price variation for the different Hicksian good components may enable a more careful treatment of these effects. However, such price information is not available in our data set.

[22] We also ran these regressions with the size of the marriage market added as an independent variable. The results obtained are qualitatively and quantitatively very similar to those reported here. The same remark applies to all our regression results.

because of more expensive real estate, and this gives rise to more public expenditures.

7 Intrahousehold Allocation

As explained in Section 2, we can also use our methodology to calculate bounds on the male and female "relative individual costs of equivalent bundles" (RICEBs) $R^m_{m,f}$ and $R^f_{m,f}$ (see (3) and (4)). Basically, these individual RICEBs quantify who consumes what relative to the household's full income. In what follows, we will investigate these RICEBs in more detail, and this will provide specific insights into intrahousehold allocation patterns. We will also use the results of this investigation to compute individual compensation schemes needed to preserve the same consumption level in case of marriage dissolution or spousal death. More generally, this illustrates the usefulness of our methodology to address the well-being questions that we listed in the Introduction.

RICEBs. Similar to before, we start by comparing the "stable" RICEB bounds, which we obtain through our identification method, with "naive" bounds. For a given individual, the naive lower bound equals the fraction of the budget share of the individual's leisure consumption (which is assignable and private), while the naive upper bound equals this lower bound plus the budget share of the household's non-leisure consumption (which is non-assignable). The results of this exercise are summarized in Table 6. Like before, we also report on the percentage point differences between the (stable and naive) upper and lower bounds (see the "Diff" columns).[23]

Once more, we conclude that our method has substantial identifying power. The stable bounds are considerably tighter than the naive bounds, with the average difference between upper and lower bounds narrowing down from 36 percentage points (for the naive bounds) to no more than 9 to 11 percentage points (for the stable bounds). The stable bounds are also informatively tight. For example, we learn that, on average, males seem to have more control over household expenditures than females: the average male RICEB is situated between 55% and 64%, while the average female RICEB is only between 47% and 57%. Like before, however, there is quite some heterogeneity between households: lower bounds for females (resp. males) range from 2% to 92% (resp. 7% to 99%) and upper bounds from 5% to 96% (resp. 15% to 99%).[24]

Individual poverty. Our RICEB estimates allow us to conduct a poverty analysis directly at the level of individuals in households rather than at the level of aggregate households. Given our particular set-up, such a poverty analysis can simultaneously account for both economies of scale in consumption (through public goods) and within-household sharing patterns (reflecting individuals'

[23] Appendix D.1 shows the empirical cumulative distribution of the stable upper and lower bounds on the individual RICEBs. Appendix D.4 gives complementary results on public and private components of the individual RICEBs reported in Table 6.

[24] We recall that the lower bound of the female (male) RICEB and upper bound of the male (female) RICEB need not necessarily add up to unity. The reason is that these RICEBs divide the value of individual consumption by total household expenditures (see (3) and (4)). Because of scale economies, the total value of consumption (summed over the two spouses) can exceed the household expenditures. See also our discussion of the measures $R^m_{m,f}$ and $R^f_{m,f}$ in (3) and (4) in Section 2.

	Interval	OLS
$\log(w_f/w_m)$	0.00253	0.00144
	(0.00204)	(0.00218)
log(total income)	-0.0258***	-0.0365***
	(0.00429)	(0.00424)
Husband has a college degree	0.00672	-0.00786
	(0.00560)	(0.00501)
One child	0.0577***	0.0583***
	(0.00574)	(0.00452)
Two children	0.0581***	0.0585***
	(0.00502)	(0.00474)
More than two children	0.0503***	0.0674***
	(0.00700)	(0.00610)
$31 \leq age_m \leq 40$	-0.00792	-0.00757*
	(0.00514)	(0.00451)
$41 \leq age_m \leq 50$	-0.0142**	-0.00215
	(0.00630)	(0.00548)
$51 \leq age_m \leq 60$	0.0131**	0.0189***
	(0.00578)	(0.00591)
$61 \leq age_m$	-0.0168***	0.00269
	(0.00546)	(0.00634)
Cohabitating	0.00142	-0.00460
	(0.00565)	(0.00526)
Home owner	0.00838**	0.00179
	(0.00407)	(0.00433)
Metro area	-0.00279	0.000337
	(0.00424)	(0.00402)
North Central	0.00296	-0.0106**
	(0.00493)	(0.00476)
South	-0.00107	-0.0191***
	(0.00457)	(0.00453)
West	-0.00776	-0.00352
	(0.00493)	(0.00508)
$age_m - age_f$	-0.000351	-0.000700*
	(0.000415)	(0.000419)
$degree_m - degree_f$	0.00212	-0.00442
	(0.00413)	(0.00410)
Constant	1.286***	1.408***
	(0.0340)	(0.0340)
Observations	1,138	1,138
R-squared		0.292

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Economies of scale and household characteristics

	Stable						Naive					
	Female			Male			Female			Male		
	Min	Max	Diff	Min	Max	Diff	Min	Max	Diff	Min	Max	Diff
Mean	0.47	0.57	0.11	0.55	0.64	0.09	0.29	0.65	0.36	0.35	0.71	0.36
Std. dev.	0.17	0.17	0.10	0.18	0.16	0.08	0.12	0.13	0.11	0.13	0.12	0.11
Min	0.02	0.05	0.00	0.07	0.15	0.00	0.00	0.23	0.10	0.00	0.29	0.10
25%	0.35	0.47	0.03	0.44	0.54	0.02	0.21	0.57	0.29	0.27	0.64	0.29
50%	0.47	0.60	0.07	0.54	0.65	0.06	0.29	0.66	0.35	0.34	0.71	0.35
75%	0.59	0.70	0.17	0.67	0.75	0.14	0.36	0.73	0.42	0.43	0.79	0.42
Max	0.92	0.96	0.57	0.99	0.99	0.57	0.71	1.00	0.79	0.77	1.00	0.79

Table 6: RICEBs of males and females

bargaining positions). To clearly expose the impact of these two mechanisms, we perform three different exercises. In our first exercise, we compute the poverty rate defined in the usual way, i.e. as the percentage of households having full income that falls below the poverty line, which we fix at 60% of the median full income in our sample of households.[25] This also equals the individual poverty rates if there would be equal sharing and no economies of scale. The results of this exercise are given in Table 7 under the heading "No economies of scale and equal sharing". We would label 12.48% of the individuals (and couples) as poor if we ignored scale economies and assumed that household resources are shared equally between males and females.

In a following exercise, we use the same household poverty line but now account for the possibility that household consumption exceeds the expenditures because of economies of scale. In particular, we increase the households' aggregate consumption levels by using the (lower and upper) scale economies estimates that we summarized in Table 3. Again, we assume equal sharing within households. Then, we can compute lower and upper bounds on individual poverty rates while accounting for the specific impact of households' scale economies. We report these results under the heading "With economies of scale and equal sharing" in Table 7. Not surprisingly, we see that poverty rates decrease when compared to the calculations that ignore intrahousehold scale economies; the estimated poverty rate is now between 5.14% (lower bound) and 10.89% (upper bound).

So far, we have computed poverty rates under the counterfactual of equal sharing within households. However, households typically do not split consumption perfectly equally. Therefore, in our third exercise, we compute poverty rates on the basis of our RICEB results summarized in Table 6. Here, we label an individual as poor if his/her RICEB-based estimate falls below the individual poverty line, which we define as half of the poverty line for couples that we used above. Like before, we can compute upper and lower bound estimates for the individual poverty rates. The outcomes are summarized under the heading "With economies of scale and unequal sharing" in Table 7. It is

[25] We remark that, while 60% of the median income is a standard measure of relative poverty (e.g. used in the definition of OECD poverty rates), in our case the poverty rate is calculated on the basis of full income instead of (the more commonly used) earnings or total expenditures. Also, our data set pertains to couples where both spouses participate in the labor market, and so our poverty line will be different from a line based on data that includes households with singles, unemployed or retired members.

interesting to compare these results with the ones that account for scale economies but assume equal intrahousehold sharing. We conclude that unequal sharing considerably deteriorates the poverty rates, both for the males and the females in our sample. In particular females seems to suffer the most: the lower and upper rates of female poverty equal 11.72% and 24.06%, which is well above the upper bound of 10.89%. In Appendix E, we provide some further insights in these poverty rates by differentiating between households with different characteristics. It illustrates that our method can be used to analyze poverty differences between males and females depending on, e.g., the number of children or region of residence.

These results fall in line with the findings of Cherchye, De Rock, Lewbel and Vermeulen (2015), who also showed that, due to unequal sharing of resources within households, the fraction of individuals living below the poverty line may be considerably greater than the fraction obtained by standard measures that ignore intrahousehold allocations. A main novelty of our analysis is that we also highlight the importance of households' scale economies in assessing individual poverty. For some households/individuals, publicness of consumption may partly offset the negative effect of unequal sharing. As we have shown, our method effectively allows us to disentangle the impact of the two channels.[26]

		Households	Males	Females
No economies of scale, equal sharing		12.48	12.48	12.48
With economies of scale and equal sharing	Lower bound	5.14	5.14	5.14
	Upper bound	10.89	10.89	10.89
With economies of scale and unequal sharing	Lower bound	-	8.32	11.72
	Upper bound	-	15.81	24.06

Table 7: Poverty rates (in %)

Household characteristics and compensation schemes. We can relate the observed inter-household heterogeneity in individual RICEBs to the observable household characteristics that were also taken up in Table 5. Like before, we conduct an interval regression that uses the lower and upper RICEB bounds as dependent variables, as well as a simple OLS regression that uses the average of these bounds. Table 8 shows our results when using, respectively, the male RICEB measure (columns 2 and 3) and the female RICEB measure (columns 4 and 5) as dependent variables. At this point, it is worth recalling that our RICEB measures capture both scale economies and intrahousehold allocation effects. To distinguish between these two types of effects, we interpret the

[26]For the sake of brevity, we focused on the importance of economies of scale in assessing individual poverty. However, our method would also allow us to investigate the role played by economies of scale and unequal sharing in assessing between and within-household consumption inequality (see e.g. Lise and Seitz, 2011 and Greenwood, Guner, Kocharkov and Santos, 2014, 2016, for alternative methods and applications).

results in Table 8 in combination with the results in Table 5. Larger economies of scale generally lead to higher RICEBs for both the husband and wife, while individual RICEBs benefit in relative terms when the individual's bargaining position improves. Thus, if an explanatory variable affects the male and female RICEBs in the same direction, then we can conclude that these estimated effects mainly reflect economies of scale. Conversely, if the male and female effects go in opposite directions, this suggests a dominant impact of intrahousehold allocation (i.e. bargaining power) mechanics.

Some interesting patterns emerge from Table 8. A higher relative wage for the female has a significantly positive effect on her share and a negative effect on the male's share. This finding is in line with the existing evidence (and our intuition): when the wife's relative wage goes up, she becomes a more attractive partner on the marriage market. As an implication, her intrahousehold bargaining position improves, and she gets greater control over the household expenses. At this point, one may also be tempted to argue that this result is actually an artefact of our set-up, which assumes that leisure is privately assignable and priced at the individual's own wage level. Indeed, if leisure demands were not responsive to their prices (i.e. individual wages), then by construction this would obtain higher RICEBs for higher relative wages. However, this alternative explanation is contradicted if we run a regression similar to the one in Table 8, but now using the private RICEB component without leisure (summarized in Table 24 of Appendix D.4) as the dependent variable. Again, we find that a higher relative wage for the female has a significantly positive impact on her private consumption share, while the opposite holds for the male's share (results available upon request).

Next, household income is moderately negatively related to female RICEBs and, albeit less outspokenly, positively related to male RICEBs (with a significant effect only for the interval regression). From Table 5, we learned that a higher household income leads to lower scale economies. Table 8 suggests that this negative effect mainly runs through the female RICEB. In this respect, if we run a regression similar to the one reported in Table 8 for the public and private components of the individual RICEBs (summarized in Table 23 of Appendix D.4), we find that private consumption goes up and public consumption goes down for both the males and the females when the household income increases (results available upon request).

Several other household characteristics also have a significant impact on the individual RICEBs. For example, a higher number of dependent children generally has a positive impact on both the male's and female's consumption shares. Apparently, both household members benefit from the increased public consumption that is associated with having children (as reported in Table 5), albeit the impact is somewhat stronger for females than for males. Further, we find that the region of residence also has an effect: male RICEBs are generally lower in the North Central, South and West regions than in the Northeast region, while the opposite holds for female RICEBs. Finally, a greater difference between the male and female ages seems to be negative for the female and positive for the male, all else equal.

By using the regression results in Table 8, we can compute individual compensation schemes

	Male		Female	
	Interval	OLS	Interval	OLS
$\log(w_f/w_m)$	-0.207***	-0.206***	0.210***	0.207***
	(0.00288)	(0.00285)	(0.00293)	(0.00298)
log(total income)	0.00856**	0.00104	-0.0359***	-0.0389***
	(0.00381)	(0.00347)	(0.00448)	(0.00398)
Husband has a college degree	-0.0266***	-0.0251***	0.0262***	0.0175***
	(0.00401)	(0.00382)	(0.00505)	(0.00461)
One child	0.0199***	0.0235***	0.0311***	0.0299***
	(0.00411)	(0.00363)	(0.00469)	(0.00398)
Two children	0.0136***	0.0202***	0.0399***	0.0381***
	(0.00410)	(0.00400)	(0.00445)	(0.00433)
More than two children	0.0188***	0.0260***	0.0282***	0.0379***
	(0.00556)	(0.00478)	(0.00674)	(0.00555)
$31 \leq age_m \leq 40$	-0.00701*	-0.00932**	0.00183	0.00188
	(0.00414)	(0.00394)	(0.00488)	(0.00404)
$41 \leq age_m \leq 50$	-0.00664	-0.00334	-0.00477	0.000404
	(0.00468)	(0.00459)	(0.00562)	(0.00471)
$51 \leq age_m \leq 60$	0.000348	0.00352	0.00878	0.0134**
	(0.00541)	(0.00501)	(0.00560)	(0.00579)
$61 \leq age_m$	0.0115*	0.0135**	-0.0284***	-0.0149**
	(0.00618)	(0.00556)	(0.00660)	(0.00685)
Cohabitating	-0.00220	0.000140	0.00219	-0.00520
	(0.00402)	(0.00414)	(0.00547)	(0.00449)
Home owner	-0.000870	-0.00220	0.00953**	0.00451
	(0.00362)	(0.00352)	(0.00405)	(0.00393)
Metro area	-0.00814***	-0.00803**	0.00489	0.00720**
	(0.00314)	(0.00314)	(0.00381)	(0.00354)
North Central	-0.0159***	-0.0156***	0.0124**	0.00399
	(0.00450)	(0.00399)	(0.00489)	(0.00428)
South	-0.0175***	-0.0209***	0.0136***	0.00462
	(0.00419)	(0.00353)	(0.00441)	(0.00420)
West	-0.0156***	-0.0126***	0.0111**	0.00626
	(0.00490)	(0.00412)	(0.00543)	(0.00478)
$age_m - age_f$	0.000685*	0.000349	-0.000856**	-0.00111***
	(0.000381)	(0.000348)	(0.000436)	(0.000401)
$degree_m - degree_f$	0.000575	-0.00139	0.00136	-0.00230
	(0.00335)	(0.00321)	(0.00417)	(0.00379)
Constant	0.499***	0.567***	0.812***	0.853***
	(0.0307)	(0.0276)	(0.0354)	(0.0311)
Observations	1,138	1,138	1,138	1,138
R-squared		0.937		0.920

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Individual RICEBs and household characteristics

that guarantee the same consumption level in case of marriage dissolution or spousal death. We conclude this section by illustrating this application for the counterfactual situation of a married couple with (*i*) the male and female of the same age and between 21 and 30 years old, (*ii*) no college degree, (*iii*) a household income that equals the sample average (with log(full income) = 8.406), (*iv*) an average wage ratio (with $\log(w_f/w_m) = -0.238$), *(v)* living in a metro area, and *(vi)* not a homeowner. For this household type, we compute male and female RICEBs for alternative scenarios in terms of household size and region of residence, by using the OLS results in Table 8.[27] This expresses the required incomes in the counterfactual situation as fractions of the household's current full potential income (= 4473.80 = exp(8.406)). The results are reported in Tables 9 and 10. The male compensations are always above the female compensations, reflecting the unequal intrahousehold sharing that we documented before.[28] Next, required compensations generally increase with the number of children, consistent with our finding that children give rise to scale economies. Finally, we find variation in compensation schemes across regions, which indicates regional differences in costs-of-living.

	Children = 0	Children = 1	Children = 2	Children > 2
Northeast	0.6168	0.6403	0.6370	0.6428
North Central	0.6012	0.6247	0.6214	0.6272
South	0.5959	0.6194	0.6161	0.6219
West	0.6042	0.6277	0.6244	0.6302

Table 9: Male RICEBs as consumption-preserving income compensations

	Children = 0	Children = 1	Children = 2	Children > 2
Northeast	0.4839	0.5138	0.5220	0.5218
North Central	0.4879	0.5178	0.5260	0.5258
South	0.4885	0.5184	0.5266	0.5264
West	0.4902	0.5201	0.5283	0.5281

Table 10: Female RICEBs as consumption-preserving income compensations

8 Conclusion

We have presented a novel structural method to empirically identify households' economies of scale that originate from public consumption (defined by Barten scales). We take it that these economies of scale imply gains from marriage, and use the observed marriage behavior to identify households'

[27] In principle, we could also have used the interval regression results in Table 5 to compute bounds on the male and female income compensations; this would have led to similar conclusions. A more ambitious alternative approach is to directly start from the revealed preference characterization in Proposition 1 to predict household behavior in new decision situations. For compactness, we will not explain this approach here, but it can proceed along the lines of nonparametric counterfactual analysis as explained by Varian (1982) and Blundell, Browning and Crawford (2008).

[28] In this respect, we remark that the male wage is higher than the female wage in the counterfactual situation under consideration (i.e. $\log(w_f/w_m) = -0.238$). This creates gender differences in potential labor incomes, which will at least partly cover the (differences in) required income compensations that we report in Tables 9 and 10.

scale economies under the maintained assumption of marital stability. Our method is intrinsically nonparametric and requires only a single consumption observation per household. In addition, the method can be implemented through simple linear programming, which is attractive from a practical point of view.[29] Our method produces informative empirical results that give insight into the structure of scale economies for alternative household types. In turn, these findings can be used to address a variety of follow-up questions (e.g. on intrahousehold allocation patterns and individual income compensations in case of marriage dissolution or spousal death).

We have demonstrated alternative uses of our method through an empirical application to consumption data drawn from the PSID, for which we assume that similar households (in terms of age, education, number of children and region of residence) operate on the same marriage market and are characterized by a homogeneous consumption technology. We found that public consumption increases with the number of children living in the household, and that particularly households in the Northeast region of the US experience more economies of scale, while richer households are generally characterized by lower scale economies. Next, we have analyzed intrahousehold allocation patterns of expenditures by computing the "relative costs of equivalent bundles" (RICEBs) for the males and females in our sample, and we showed the relevance of these RICEBs for individual poverty analysis (revealing substantial inequalities between males and females in households with dependent children). We found that the individual RICEBs are significantly related to the intrahousehold wage ratio, the household's full incomes, the number of children, the interspousal age differences and the region of residence. As an implication, the same variables also impact the individual compensation schemes required to guarantee the same consumption level in case of marriage dissolution or wrongful death. For example, we found that for females these compensations (as percentages of actual household incomes) increase with the relative wage (female wage divided by male wage) and number of children, while it decreases with the total income and the age difference (male age minus female age).

In our application, we have made a number of simplifying modeling choices. Weakening these assumptions can enrich the empirical investigation, and the insights that are drawn from it. For example, as we discussed in Section 2, we have assumed a fairly simple household production setting, in which each individual produces a single domestic good. An interesting avenue for follow-up research consists of including more sophisticated production processes, in which the domestic goods are produced by the two spouses simultaneously. See, for example, Goussé, Jacquemet and Robin (2017), who also consider a marriage matching context. By extending our methodology to also identify such a more complicated within-household production structure, we will obtain a toolkit that can empirically address research questions related to, for example, marriage matching on productivity and specialization in marriage. Such an extension can also provide a fruitful ground to explicitly include the (welfare of) children in the structural identification analysis. Next, because

[29]This linear programming structure can actually also be useful from an inferential point of view. For example, a recent paper of Kaido, Molinari and Stoye (2016) introduces a bootstrap-based procedure to do inference on the value of a linear program with estimated constraints. We see the adaptation of this work to our identification method as an interesting avenue for follow-up research.

our method uses information on individual wages, we have restricted our analysis to couples in which both partners are active on the labor market. Obviously, an interesting further development consists of including couples with inactive partner(s) (and unobserved wage(s)). In such instances, we can proceed by using shadow wages, which can also be identified on the basis of a structural household production model. For example, following a similar nonparametric approach, Cherchye, De Rock, Vermeulen and Walther (2017) showed how to infer shadow prices under the assumption of efficient household production and constant returns-to-scale. Clearly, integrating these insights in our methodological framework would significantly widen the range of empirical questions that can be addressed.

At the empirical level, a specific feature of our analysis is that we used only a single consumption observation per household. This shows the empirical usefulness of our method even if only cross-sectional household data can be used. In practice, however, panel data sets containing time-series of observations for multiple households are increasingly available. The use of household-specific time-series would allow us to additionally exploit the specific testable implications of our assumption that collective households realize Pareto efficient intrahousehold allocations (under the assumption of time-invariant individual preferences; see Cherchye, De Rock and Vermeulen, 2007, 2011, for detailed discussions). Obviously, this can only enrich the analysis. For example, it would allow us to recover individual indifference curves, which enables the computation of indifference scales as defined by Browning, Chiappori and Lewbel (2013). These indifference scales can be used to compute Hicksian-type income compensations (i.e. for fixed utility levels) in case of divorce or spousal death, which constitute useful complements to the (Slutsky-type) RICEB-based compensations (with fixed consumption levels) that we considered in the current study. In addition, the use of household-specific time-series could also allow us to relax our assumption that observationally similar households are characterized by a homogeneous consumption technology, and thus to account for unobserved heterogeneity of the household technologies.

Finally, to operationalize the no blocking pairs condition in our empirical method we need to define individuals' marriage markets. As discussed in Section 3, our empirical application adopted a minimalistic approach by focusing on small marriage markets containing observationally similar households. In addition, our results appeared to be robust for the assumption that individuals consider only a subset of the potential partners in the marriage markets that we constructed. Still, we do see a more refined modeling of individuals' marriage markets as a useful extension of the method that we proposed in the current paper. Intuitively, this boils down to constructing individual-specific "consideration sets" for the particular context of marital matching.[30] Such a construction may use insights from the literature on structurally explaining observed marriage patterns (see, for example, Choo and Siow, 2006, and, more recently, Dupuy and Galichon, 2014).

[30]The use of consideration sets received substantial attention in the recent literature on revealed preferences (see, for example, Manzini and Mariotti, 2014). This existing work can provide a useful starting point to develop this question further.

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APPENDICES - FOR ONLINE PUBLICATION

Appendix A: Proof of Proposition 1

Our proof builds on Cherchye, Demuynck, De Rock and Vermeulen (2017). These authors' Proposition 1 lists the necessary and sufficient conditions for rationalizability of a data set $\mathcal{D}$. We recapture these conditions for our setting in Proposition 2. The conditions are nonlinear in unknowns and therefore difficult to use in practice. We start from Proposition 2 to obtain Proposition 1 of the main text. This result defines our conditions that are linear in unknowns and necessary for rationalizability of a given data set.

Proposition 2 *The data set $\mathcal{D}$ is rationalizable by a stable matching if and only if there exist,*

(a) for each matched pair $(m, \sigma(m))$, nonlabor incomes n_m, $n_{\sigma(m)} \in \mathbb{R}$ that satisfy

$$n_{m,\sigma(m)} = n_m + n_{\sigma(m)},$$

(b) for each matched pair $(m, \sigma(m))$, individual quantities $q^m_{m,\sigma(m)}, q^{\sigma(m)}_{m,\sigma(m)} \in \mathbb{R}^K_+$ and public quantities $Q_{m,\sigma(m)} \in \mathbb{R}^K_+$ that satisfy

$$q^m_{m,\sigma(m)} + q^{\sigma(m)}_{m,\sigma(m)} + Q_{m,\sigma(m)} = q_{m,\sigma(m)},$$

(c) for each pair (m, f), individual quantities $q^m_{m,f}, q^f_{m,f} \in \mathbb{R}^K_+$ and public quantities $Q_{m,f} \in \mathbb{R}^K_+$ that satisfy

$$p_{m,f}(q^m_{m,f} + q^f_{m,f}) + p_{m,f}Q_{m,f} = y_{m,f}$$

(d) for each m and f, private quantities $q^m_{m,\phi}, q^f_{\phi,f} \in \mathbb{R}^K_+$ and public quantities $Q_{m,\phi}, Q_{\phi,f} \in \mathbb{R}^K_+$ that satisfy

$$p_{m,\phi}q^m_{m,\phi} + p_{m,\phi}Q_{m,\phi} = y_{m,\phi} \text{ and}$$
$$p_{\phi,f}q^f_{\phi,f} + p_{\phi,f}Q_{\phi,f} = y_{\phi,f},$$

(e) for each pair (m, f), personalized prices $p^m_{m,f}, p^f_{m,f} \in \mathbb{R}^K_{++}$ that satisfy

$$p^m_{m,f} + p^f_{m,f} = p_{m,f},$$

and strictly positive numbers $U^m_{m,f}, U^m_{m,\phi}, U^f_{m,f}, U^f_{\phi,f}$ and $\delta_{m,f}, \delta_{m,\phi}, \lambda_{m,f}, \lambda_{\phi,f}$ that satisfy, for all males $m \in M$ and females $f \in F$, *(i) the inequalities*

$$
\begin{aligned}
U^m_{m,f} - U^m_{m,\phi} &\leq \delta_{m,\phi}(p_{m,\phi}(q^m_{m,f} - q^m_{m,\phi}) + p_{m,\phi}(Q_{m,f} - Q_{m,\phi})),\\
U^m_{m,f} - U^m_{m,f'} &\leq \delta_{m,f'}(p_{m,f'}(q^m_{m,f} - q^m_{m,f'}) + p^m_{m,f'}(Q_{m,f} - Q_{m,f'})),\\
U^m_{m,\phi} - U^m_{m,f'} &\leq \delta_{m,f'}(p_{m,f'}(q^m_{m,\phi} - q^m_{m,f'}) + p^m_{m,f'}(Q_{m,\phi} - Q_{m,f'})),
\end{aligned}
$$

and

$$
\begin{aligned}
U^f_{m,f} - U^f_{\phi,f} &\leq \lambda_{\phi,f}(p_{\phi,f}(q^f_{m,f} - q^f_{\phi,f}) + p^f_{\phi,f}(Q_{m,f} - Q_{\phi,f})),\\
U^f_{m,f} - U^f_{m',f} &\leq \lambda_{m',f}(p_{m',f}(q^f_{m,f} - q^f_{m',f}) + p^f_{m',f}(Q_{m,f} - Q_{m',f})),\\
U^f_{\phi,f} - U^f_{m',f} &\leq \lambda_{m',f}(p_{m',f}(q^f_{\phi,f} - q^f_{m',f}) + p^f_{m',f}(Q_{\phi,f} - Q_{m',f})),
\end{aligned}
$$

(ii) the individual rationality restrictions

$$
\begin{aligned}
U^m_{m,\sigma(m)} &\geq U^m_{m,\phi} \text{ and}\\
U^f_{\sigma(f),f} &\geq U^f_{\phi,f},
\end{aligned}
$$

(iii) and the no blocking pair restrictions

$$
\begin{aligned}
U^m_{m,\sigma(m)} &\geq U^m_{m,f} \text{ and}\\
U^f_{\sigma(f),f} &\geq U^f_{m,f}.
\end{aligned}
$$

Proof of Proposition 1. By starting from Proposition 2, we can derive Proposition 1 in the main text, which gives necessary conditions for rationalizability that are linear in unknowns. The proof of Proposition 1 goes as follows:

Proof. We assume that the public consumption for all matched couples could be represented by Barten scales A. Thus, we use $Q_{m,\sigma(m)} = Aq_{m,\sigma(m)}$ for all m. Then, the individual rationality condition (i) in Proposition 1 is obtained from combining the individual rationality restrictions (ii) with the inequalities (i) in Proposition 2. In particular, we get

$$
\begin{aligned}
0 &\leq p_{m,\phi}(q^m_{m,\sigma(m)} - q^m_{m,\phi}) + p_{m,\phi}(Aq_{m,\sigma(m)} - Q_{m,\phi}) \text{ and}\\
0 &\leq p_{\phi,f}(q^f_{\sigma(f),f} - q^f_{\phi,f}) + p_{\phi,f}(Aq_{\sigma(f),f} - Q_{\phi,f}),
\end{aligned}
$$

which gives

$$
\begin{aligned}
y_{m,\phi} &\leq p_{m,\phi}q^m_{m,\sigma(m)} + p_{m,\phi}Aq_{m,\sigma(m)} \text{ and}\\
y_{\phi,f} &\leq p_{\phi,f}q^f_{\sigma(f),f} + p_{\phi,f}Aq_{\sigma(f),f}.
\end{aligned}
$$

Similarly, the no blocking pair restriction (ii) in Proposition 1 is obtained by combining the no blocking pair restrictions (*iii*) with (*i*) in Proposition 2. In this case, we obtain

$$0 \leq p_{m,f}(q^m_{m,\sigma(m)} - q^m_{m,f}) + p^m_{m,f}(Aq_{m,\sigma(m)} - Q_{m,f}) \text{ and}$$
$$0 \leq p_{m,f}(q^f_{\sigma(f),f} - q^f_{m,f}) + p^f_{m,f}(Aq_{\sigma(f),f} - Q_{m,f}),$$

which add up to (using condition (e) in Proposition 2)

$$y_{m,f} \leq p_{m,f}q^m_{m,\sigma(m)} + p^m_{m,f}Aq_{m,\sigma(m)} + p_{m,f}q^f_{\sigma(f),f} + p^f_{m,f}Aq_{\sigma(f),f}, \text{ or}$$
$$y_{m,f} \leq p_{m,f}q^m_{m,\sigma(m)} + p_{m,f}q^f_{\sigma(f),f} + p_{m,f}A\max\{q_{m,\sigma(m)}, q_{\sigma(f),f}\},$$

where $\max\{q_{m,\sigma(m)}, q_{\sigma(f),f}\}$ defines the element-by-element maximum, i.e. $q = \max\{q^1, q^2\}$ with $q_k = \max\{q^1_k, q^2_k\}$ for all k. ■

Appendix B: General Consumption Technology

In Section 2, we defined the technology matrix A as a diagonal $K \times K$ matrix, with entries bounded between 0 and 1. This specification excludes disceconomies of scale by construction. In principle, our methodology can be generalized to allow for both non-zero non-diagonal elements of A and diseconomies of scale. Particularly, let $A \in \mathbb{R}^{N\times k}$ be a matrix such that $0 \leq a_{ij} \leq 1$ and $B \in \mathbb{R}^{n\times k}$ be a matrix such that $0 \leq b_{ij} \leq 1$. Then, we can specify

$$Q = Aq,$$
$$q^m + q^f = Bq,$$
$$A'e_N + B'e_n \leq e_k,$$

where $e_I \in \mathbb{R}^{I\times 1}$ is a vector of ones. A strict inequality in the last equation indicates the possibility of diseconomies of scale in household consumption. Our empirical analysis in the main text uses the special case of this general technology specification where both $A, B \in \mathbb{R}^{k\times k}$ are diagonal matrices such that $A'e_k + B'e_k = e_k$ (which is equivalent to setting $B = I - A$).

As a final remark, when maximizing stability of marriage (as in the objective (7)), our method will mechanically define the matrices A and B such that no diseconomies of scale are revealed (i.e. no losses from marriage). As an implication, we will not be able to identify consumption diseconomies of scale without making further assumptions about the stability of marriage.

Appendix C: Supplementary Data Information

C.1 Composition of the Hicksian Good (source: PSID codebook)

- Food expenditures: expenditures for food at home, delivered and eaten away from home.

- Housing expenditures: expenditures for mortgage and loan payments, rent, property tax, insurance, utilities, cable TV, telephone, internet charges, home repairs and home furnishings.
- Transportation expenditures: expenditures for vehicle loan, lease, and down payments, insurance, other vehicle expenditures, repairs and maintenance, gasoline, parking and car pool, bus fares and train fares, taxicabs and other transportation.
- Education expenditures: total school-related expenses.
- Childcare expenditures: total expenditures on child care.
- Health care expenditures: expenditures for hospital and nursing home, doctor, prescription drugs and insurance.
- Clothing expenditures: total expenses on clothing and apparel, including footwear, outerwear, and products such as watches or jewelry.
- Recreation expenditures: total expenses on trips and vacations, including transportation, accommodations, recreational expenses on trips, recreation and entertainment, including tickets to movies, sporting events, and performing arts and hobbies including exercise, bicycles, trailers, camping, photography, and reading materials.

C.2 Size of Marriage Markets

Tables 11-14 present the sizes of the marriage markets that we consider in our empirical application.

	Degree = 0					Degree = 1				
Nr of children	0	1	2	> 2	Total	0	1	2	> 2	Total
Age$_m \leq 30$	3	3	3	1	10	18	3	1		22
$31 \leq$ age$_m$ *leq* 40	7	8	6	8	29	16	8	15	6	45
$41 \leq$ age$_m$ *leq* 50	2	1	2	1	6	4	6	21	8	39
$51 \leq$ age$_m$ *leq* 60	6	1			7	25	6	3	1	35
$61 \leq$ age$_m$	3				3	16		1		17
Total	21	13	11	10	55	79	23	41	15	158

Table 11: Marriage market sizes for the Northeast region

C.3 Assortative Matching

Table 15 shows the number of couples in the sample for different education levels (captured by an education dummy) of husband and wife. (The total number of couples in this table is below the number of couples that we consider in our empirical application, because information on the wife's education level is missing for about 15 percent of the couples.) Table 16 has the same interpretation as Table 15 and pertains to the age category of husband and wife. In both cases, we observe a high degree of assortativeness.

	Degree = 0					Degree = 1				
Nr of children	0	1	2	> 2	Total	0	1	2	> 2	Total
$\text{Age}_m \leq 30$	18	12	6	2	38	28	7	7		42
$31 \leq \text{age}_m \leq 40$	11	6	17	13	47	21	15	34	15	85
$41 \leq \text{age}_m \leq 50$	6	5	5	3	19	10	5	20	12	47
$51 \leq \text{age}_m \leq 60$	16	2		1	19	24	4	7	1	36
$61 \leq \text{age}_m$	2				2	18				18
Total	53	25	28	19	125	101	31	68	28	228

Table 12: Marriage market sizes for the North Central region

	Degree = 0					Degree = 1				
Nr of children	0	1	2	> 2	Total	0	1	2	> 2	Total
$\text{Age}_m \leq 30$	16	13	11	4	44	35	13	8		56
$31 \leq \text{age}_m \leq 40$	10	12	29	17	68	28	29	39	25	121
$41 \leq \text{age}_m \leq 50$	7	12	6	1	26	10	25	23	16	74
$51 \leq \text{age}_m \leq 60$	14	2		1	17	31	7	7		45
$61 \leq \text{age}_m$	9				9	38	1	1		40
Total	56	39	46	23	164	142	75	78	41	336

Table 13: Marriage market sizes for the South region

	Degree = 0					Degree = 1				
Nr of children	0	1	2	> 2	Total	0	1	2	> 2	Total
$\text{Age}_m \leq 30$	12	7	4		23	19	11	2	2	34
$31 \leq \text{age}_m \leq 40$	4	3	9	9	25	16	21	17	12	66
$41 \leq \text{age}_m \leq 50$	6	2	5	9	22	4	5	17	7	33
$51 \leq \text{age}_m \leq 60$	10	2			12	22	1	2	1	26
$61 \leq \text{age}_m$	4				4	12			0	12
Total	36	14	18	18	86	73	38	38	22	171

Table 14: Marriage market sizes for the West region

	$\text{Degree}_f = 0$	$\text{Degree}_f = 1$	Total
$\text{Degree}_m = 0$	122 (10.72)	213 (18.72)	335 (29.44)
$\text{Degree}_m = 1$	115 (10.11)	688 (60.46)	803(70.56)
Total	237 (20.83)	901 (79.17)	1138 (100)

Table 15: Number (fraction) of observed couples for different education levels (captured by an education dummy) of husband and wife

	$\text{Age}_f \leq 30$	$31 \leq \text{age}_f \leq 40$	$41 \leq \text{age}_f \leq 50$	$51 \leq \text{age}_f \leq 60$	$61 \leq \text{age}_f$	Total
$\text{Age}_m \leq 30$	240 (18.15)	29 (2.19)	0 (0.00)	0 (0.00)	0 (0.00)	269 (20.35)
$30 \leq \text{age}_m \leq 40$	109 (8.25)	360 (27.23)	17 (1.29)	0 (0.00)	0 (0.00)	486 (36.76)
$40 \leq \text{age}_m \leq 50$	3 (0.23)	87 (6.58)	164 (12.41)	12 (0.91)	0 (0.00)	266 (20.12)
$50 \leq \text{age}_m \leq 60$	1 (0.08)	4 (0.30)	47 (3.56)	130 (9.83)	14 (1.06)	196 (14.83)
$60 \leq \text{age}_m$	0 (0.00)	0 (0.00)	4 (0.30)	41 (3.10)	60 (4.54)	105 (7.94)
Total	353 (26.70)	480 (36.31)	232 (17.55)	183(13.84)	74 (5.60)	1322 (100)

Table 16: Number (fraction) of observations by age category of husband and wife

C.4 Budget Shares

For the different subgroups of households, Tables 17-20 report average budget shares of the five consumption goods that we consider.

	Children = 0	Children = 1	Children = 2	Children > 2	Total
Female Leisure	30.31	28.87	27.44	25.93	28.74
Male Leisure	35.66	35.25	34.61	33.10	34.98
Female household work	5.35	5.97	6.29	7.76	6.02
Male household work	4.05	4.05	4.71	5.11	4.36
Market Good	24.62	25.86	26.96	28.11	25.91

Table 17: Budget shares (in %) by number of children

	Degree = 0	Degree = 1	Total
Female Leisure	28.96	28.63	28.74
Male Leisure	33.38	35.75	34.98
Female household work	6.33	5.87	6.02
Male household work	4.24	4.41	4.36
Market Good	27.10	25.33	25.91

Table 18: Budget shares (in %) by husband's college degree

	Northeast	North Central	South	West	Total
Female Leisure	29.74	28.86	28.24	28.69	28.74
Male Leisure	34.19	35.02	35.23	35.10	34.98
Female household work	6.28	6.24	5.92	5.71	6.02
Male household work	4.71	4.29	4.16	4.54	4.36
Market Good	25.08	25.59	26.45	25.96	25.91

Table 19: Budget shares (in %) by region of residence

	≤ 30	31-40	41-50	51-60	>60	Total
Female Leisure	29.83	29.01	27.56	28.15	28.76	28.74
Male Leisure	33.23	34.27	36.26	36.54	36.58	34.98
Female household work	5.97	6.07	5.78	6.09	6.45	6.02
Male household work	4.20	4.16	4.50	5.09	3.92	4.36
Market Good	26.77	26.50	25.90	24.14	24.28	25.91

Table 20: Budget shares (in %) by age category of husband

Appendix D: Additional Empirical Results

D.1 Empirical Distributions of Scale Economies and RICEBs

Figures 1 and 2 show the empirical cumulative distribution functions (CDFs) of the bounds on our scale economies and individual RICEB measures.

Figure 1: CDFs of bounds on scale economies

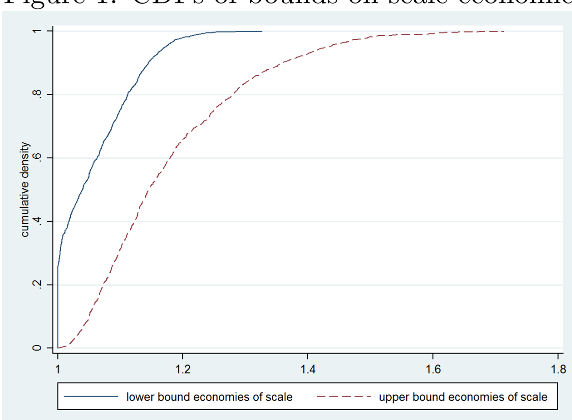
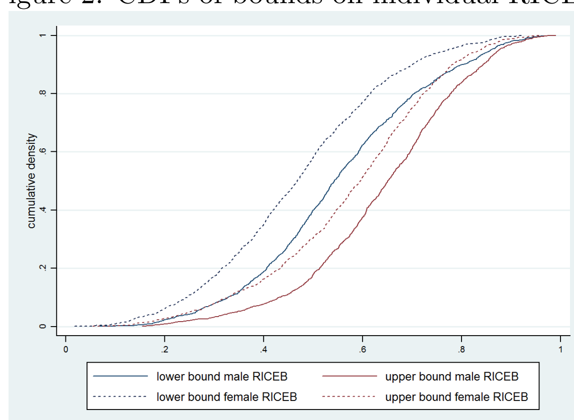


Figure 2: CDFs of bounds on individual RICEBs



D.2 Divorce Costs, Match Quality and Household Characteristics

Table 2 shows the presence of heterogeneity among couples in terms of the divorce costs needed to rationalize their behavior. In order to explore the relation between the divorce costs and observable household characteristics, we conduct a similar regression exercise as Cherchye, Demuynck, De Rock and Vermeulen (2017). Following these authors, we use our stability indices to construct two empirical indicators of match quality: the first measure is calculated as the maximum post-divorce income loss defined over all observed exit options from marriage (i.e. remarriage or become single), the second measure is calculated as the average post-divorce income loss defined over all these exit options. The intuitive idea behind these two indicators is that higher post-divorce income loss required for rationalizing the observed marriage behavior reveals higher match quality.

Table 21 reports the results for the two regression specifications that use these alternative ("Maximum" and "Average") match quality indicators as dependent variables. Our findings are qualitatively similar to the ones of Cherchye, Demuynck, De Rock and Vermeulen (2017). We find that larger marriage markets generally imply that more match quality is required to rationalize marriage. This seems intuitive as larger markets imply more remarriage options, which effectively makes that higher match quality is needed to rationalize the behavior. Next, we see that average wages and absolute wage difference correlate positively with match quality, whereas the opposite applies to age, total income and number of children. Finally, for the average match quality indicator, we find a positive effect of home ownership. This may reflect that home ownership is used as a device to show marital commitment (see, for example, Lafortune and Low (2017) for similar empirical findings).

	Maximum	Average
Average wage	0.0161	0.0118***
	(0.0181)	(0.00417)
Absolute wage difference	0.0370***	0.00549***
	(0.00421)	(0.00112)
Average age	-0.0161**	-0.00129
	(0.00661)	(0.000806)
Absolute age difference	-0.0405**	-0.00336*
	(0.0171)	(0.00182)
Total income	-0.000264**	-8.29e-05***
	(0.000108)	(2.72e-05)
Number of children	-0.346***	-0.0148***
	(0.0502)	(0.00436)
Education difference	0.0833	0.00446
	(0.127)	(0.00889)
Size of marriage market	0.0745***	0.00187***
	(0.00658)	(0.000438)
Cohabitating	0.130	0.0317
	(0.263)	(0.0367)
Home owner	0.0470	0.0325*
	(0.165)	(0.0194)
Metro area	0.136	-0.00393
	(0.152)	(0.0134)
Constant	1.021***	0.0824***
	(0.313)	(0.0299)
Observations	1,138	1,138
R-squared	0.241	0.206

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 21: Match quality (measured as post-divorce income loss) and household characteristics

D.3 Interhousehold Heterogeneity and Publicness of Domestic Production and Market Consumption

The regression results in Table 22 complement the ones in Table 5. As dependent variable, it uses the average of the diagonal entries of the A matrix that are summarized in Table 4, which correspond to the minimum and maximum estimates of our scale economies measure $R_{m,f}$. We see that the public component of domestic work by the female increases with the presence of children, while the opposite holds for domestic work by the male. Next, the public component of the Hicksian good is higher for households with children than for households without children. We also find that publicness of domestic work by the female is more prevalent in households with older husbands, whereas this pattern is reversed for domestic work by males.

D.4 Private and Public Components of RICEBs

From (3) and (4), we can decompose the male and female RICEBs into a private component $(p_{m,\phi}q^{m}_{m,f}/y_{m,f})$ and a public component $(p_{m,\phi}Aq_{m,f}/y_{m,f})$. Table 23 reports on these private and public components corresponding to the minimum and maximum estimates of $R^{m}_{m,f}$ and $R^{f}_{m,f}$ (summarized in Table 6). Table 24 presents summary statistics on the private shares of the individual RICEBs without leisure components.

	Domestic work by female	Domestic work by male	Hicksian good
$\log(w_f/w_m)$	0.00241	-0.0152	-0.00946*
	(0.0112)	(0.0101)	(0.00542)
log(total income)	0.0121	-0.00639	-0.0252**
	(0.0208)	(0.0199)	(0.0109)
Husband has college degree	0.0807***	-0.146***	-0.0230*
	(0.0256)	(0.0244)	(0.0127)
One child	0.00388	-0.0410*	0.187***
	(0.0255)	(0.0225)	(0.0116)
Two children	0.0763***	0.00893	0.126***
	(0.0237)	(0.0214)	(0.0118)
More than two children	0.183***	-0.0307	0.0851***
	(0.0299)	(0.0254)	(0.0171)
$31 \leq age_m \leq 40$	0.0700***	-0.0957***	-0.0153
	(0.0218)	(0.0234)	(0.0113)
$41 \leq age_m \leq 50$	0.113***	-0.0691***	0.000707
	(0.0265)	(0.0253)	(0.0136)
$51 \leq age_m \leq 60$	0.101***	-0.0348	0.0121
	(0.0319)	(0.0314)	(0.0144)
$61 \leq age_m$	0.00845	-0.0634*	-0.0103
	(0.0271)	(0.0359)	(0.0180)
Cohabitating	-0.00483	-0.0196	-0.00106
	(0.0278)	(0.0270)	(0.0138)
Home owner	0.00136	-0.0115	0.00317
	(0.0207)	(0.0194)	(0.0104)
Metro area	-0.0291	0.0336*	0.0128
	(0.0200)	(0.0175)	(0.0100)
North Central	0.0381	-0.0438*	-0.0150
	(0.0236)	(0.0228)	(0.0122)
South	0.0985***	-0.126***	-0.0424***
	(0.0222)	(0.0201)	(0.0123)
West	0.0680***	0.0114	-0.00825
	(0.0211)	(0.0272)	(0.0133)
$age_m - age_f$	-0.00262	0.00176	-0.000130
	(0.00233)	(0.00205)	(0.00114)
$degree_m - degree_f$	-0.00737	0.000430	-0.0168
	(0.0205)	(0.0199)	(0.0102)
Constant	0.0833	0.515***	0.468***
	(0.164)	(0.158)	(0.0866)
Observations	1,135	1,096	1,138
R-squared	0.126	0.158	0.264

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 22: Household characteristics and publicness of domestic work and market consumption

	Female				Male			
	Minimum		Maximum		Minimum		Maximum	
	Private	Public	Private	Public	Private	Public	Private	Public
Mean	0.3859	0.0827	0.4207	0.1539	0.4592	0.0934	0.4951	0.1447
Std. dev.	0.1644	0.0533	0.1690	0.0995	0.1752	0.0617	0.1732	0.0953
Min	0.0106	0.0000	0.0114	0.0006	0.0434	0.0000	0.0607	0.0000
25%	0.2692	0.0420	0.3030	0.0809	0.3338	0.0462	0.3780	0.0764
50%	0.3833	0.0741	0.4254	0.1324	0.4472	0.0855	0.4933	0.1277
75%	0.4901	0.1157	0.5356	0.2036	0.5777	0.1294	0.6168	0.1873
Max	0.8600	0.3268	0.8819	0.6396	0.9464	0.4227	0.9555	0.6285

Table 23: RICEB components

	Female		Male	
	Minimum	Maximum	Minimum	Maximum
Mean	0.0985	0.1333	0.1094	0.1453
Std. dev.	0.0875	0.0914	0.0910	0.0908
Min	0.0000	0.0000	0.0000	0.0000
25%	0.0238	0.0632	0.0317	0.0800
50%	0.0845	0.1280	0.0943	0.1396
75%	0.1500	0.1891	0.1658	0.2016
Max	0.4996	0.5116	0.6438	0.7078

Table 24: Private shares of male and female RICEBs without leisure

D.5 Poverty Rates for Specific Household Types

Tables 25 and 26 present poverty rates similar to the ones in Table 7, but now distinguishing between households with different numbers of children (Table 25) and regions of residence (Table 26).

		Children = 0	Children = 1	Children = 2	Children > 2
No scale economies and equal sharing		12.30	10.47	15.60	12.50
With economies of scale and equal sharing	Lower bound	6.06	3.88	4.28	5.68
	Upper bound	10.52	8.91	14.07	10.23
With economies of scale and unequal sharing: male	Lower bound	11.23	5.43	5.50	5.11
	Upper bound	19.43	12.02	13.46	13.64
With economies of scale and unequal sharing: female	Lower bound	11.41	9.69	11.93	14.77
	Upper bound	21.21	21.71	26.61	29.55

Table 25: Poverty rates (in %) for different household compositions

		Northeast	North Central	South	West
No scale economies and equal sharing		15.96	12.50	11.80	12.06
With economies of scale and equal sharing	Lower bound	6.57	5.40	6.60	5.45
	Upper bound	15.02	10.80	10.20	10.89
With economies of scale and unequal sharing: male	Lower bound	7.51	10.23	8.00	7.39
	Upper bound	20.19	16.19	13.40	17.90
With economies of scale and unequal sharing: female	Lower bound	13.62	13.36	12.80	8.95
	Upper bound	25.35	25.57	22.80	24.51

Table 26: Poverty rates (in %) for different regions

Appendix F: Robustness Checks

F.1 Using Average Wages To Evaluate Spousal Domestic Work

In our baseline empirical setting, we used the individual wage rate as the price of an individual's time. Further, when modeling an individual's exit option of becoming single (in the individual rationality restrictions), we assumed that exactly the same public good produced by the absent spouse was bought on the market, and we used this spouse's wage as the price for his/her household work in defining $p_{m,\phi}$ and $p_{\phi,f}$. As a robustness check, we consider the alternative that uses the sample averages of female and male wages to define $p_{m,\phi}$ and $p_{\phi,f}$. Tables 27 and 28 show our main results. These findings can be compared to the ones in Tables 3, 5, 6 and 8 in the main text. We find that our estimates are only marginally affected, which makes that our main conclusions are not crucially depending on the choice for the price of an individual's time.

	Economies of scale			Female RICEB			Male RICEB		
	Min	Max	Diff	Min	Max	Diff	Min	Max	Diff
Mean	1.0397	1.1776	0.1379	0.4648	0.5939	0.1291	0.5500	0.6601	0.1101
Std. dev.	0.0511	0.1281	0.1544	0.1822	0.1939	0.1195	0.1846	0.1902	0.1054
Min	1.0000	1.0000	0.0000	0.0106	0.0502	0.0000	0.0664	0.1393	0.0000
25%	1.0000	1.0770	0.0000	0.3395	0.4698	0.0361	0.4278	0.5359	0.0346
50%	1.0140	1.1445	0.0999	0.4631	0.6057	0.0968	0.5410	0.6615	0.0828
75%	1.0713	1.2539	0.2517	0.5849	0.7248	0.1955	0.6717	0.7843	0.1642
Max	1.2521	1.7130	0.7131	0.9798	1.4946	0.9822	1.0360	1.4183	0.9019

Table 27: Economies of scale and RICEBs when household work by current spouse is evaluated at average wage

F.2 Exactly Stable Couples

As one may argue that the presence of non-zero divorce costs is effectively an indicator of marital instability, we have redone our main analyses for the subsample of couples that do not require a

	Economies of scale		Female RICEB		Male RICEB	
	Interval	OLS	Interval	OLS	Interval	OLS
$\log(w_f/w_m)$	0.00238	0.00167	-0.226***	-0.226***	0.218***	0.215***
	(0.00190)	(0.00213)	(0.00276)	(0.00291)	(0.00334)	(0.00332)
log(total income)	-0.0200***	-0.0328***	-0.0187***	-0.0418***	-0.0650***	-0.0738***
	(0.00392)	(0.00424)	(0.00398)	(0.00442)	(0.00527)	(0.00492)
Husband has college degree	0.0130***	-0.0134***	-0.0257***	-0.0272***	0.0279***	0.0159***
	(0.00460)	(0.00489)	(0.00414)	(0.00451)	(0.00556)	(0.00517)
One child	0.0426***	0.0550***	0.0193***	0.0271***	0.0265***	0.0291***
	(0.00563)	(0.00464)	(0.00385)	(0.00422)	(0.00520)	(0.00468)
Two children	0.0313***	0.0505***	0.0142***	0.0285***	0.0292***	0.0347***
	(0.00494)	(0.00492)	(0.00375)	(0.00494)	(0.00504)	(0.00505)
> 2 children	0.00865	0.0550***	0.0173***	0.0329***	0.0216***	0.0400***
	(0.00602)	(0.00583)	(0.00532)	(0.00510)	(0.00706)	(0.00577)
$31 \leq age_m \leq 40$	-0.00710	-0.0123***	-0.00537	-0.0132***	-0.000656	-0.00477
	(0.00463)	(0.00461)	(0.00406)	(0.00484)	(0.00540)	(0.00478)
$41 \leq age_m \leq 50$	0.00194	-0.00208	-0.00184	-0.00598	0.00257	-0.000230
	(0.00587)	(0.00563)	(0.00472)	(0.00553)	(0.00651)	(0.00550)
$51 \leq age_m \leq 60$	0.0105*	0.0166***	0.00683	0.00718	0.00977	0.0143**
	(0.00538)	(0.00612)	(0.00522)	(0.00547)	(0.00677)	(0.00683)
$61 \leq age_m$	-0.0372***	-0.0119*	0.0168**	0.0173**	-0.0322***	-0.0166**
	(0.00452)	(0.00665)	(0.00661)	(0.00673)	(0.00734)	(0.00770)
Cohabitating	0.00324	-0.00437	0.000341	-0.00167	0.000389	-0.0105**
	(0.00517)	(0.00527)	(0.00449)	(0.00501)	(0.00605)	(0.00512)
Home owner	0.00675*	-0.000303	-0.00139	-0.00509	0.00925*	0.00106
	(0.00369)	(0.00439)	(0.00357)	(0.00420)	(0.00475)	(0.00458)
Metro area	-0.000773	0.00191	-0.00547*	-0.00636*	0.00541	0.00750*
	(0.00356)	(0.00389)	(0.00316)	(0.00384)	(0.00425)	(0.00408)
North Central	-0.00783*	-0.0169***	-0.0183***	-0.0191***	0.00906*	-0.000836
	(0.00421)	(0.00487)	(0.00435)	(0.00439)	(0.00534)	(0.00472)
South	0.00856**	-0.0205***	-0.0179***	-0.0252***	0.0175***	0.00528
	(0.00427)	(0.00470)	(0.00401)	(0.00383)	(0.00490)	(0.00470)
West	-0.00173	-0.000922	-0.0142***	-0.0132***	0.0132**	0.00647
	(0.00457)	(0.00515)	(0.00472)	(0.00438)	(0.00605)	(0.00539)
$age_m - age_f$	-0.000239	-0.000540	0.000685*	0.000258	-0.000776	-0.00102**
	(0.000373)	(0.000432)	(0.000392)	(0.000398)	(0.000474)	(0.000445)
$degree_m - degree_f$	0.00244	-0.00500	-0.000510	-0.00175	0.00343	-0.000510
	(0.00359)	(0.00407)	(0.00350)	(0.00384)	(0.00478)	(0.00448)
Constant	1.224***	1.379***	0.720***	0.934***	1.064***	1.164***
	(0.0309)	(0.0342)	(0.0330)	(0.0362)	(0.0423)	(0.0394)
Observations	1,138	1,138	1,138	1,138	1,138	1,138
R-squared		0.286		0.933		0.910

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 28: Economies of scale, RICEBs and household characteristics when household work by current spouse is evaluated at average wage

divorce cost for any exit option to rationalize the observed consumption and marriage behavior. This criterion led us to drop 480 couples, and we redid our empirical exercises for the remaining 842 "exactly stable" couples. Tables 29, 30 and 31 summarize our results. When comparing these results to the ones in Tables 3, 5, 6 and 8 in the main text, we find that our main conclusions remain unaffected.

	Stable			Naive		
	Min	Max	Diff	Min	Max	Diff
Mean	1.05	1.23	0.18	1.00	1.38	0.38
Std. dev.	0.06	0.12	0.16	0.00	0.11	0.11
Min	1.00	1.01	0.00	1.00	1.12	0.12
25%	1.00	1.14	0.00	1.00	1.31	0.31
50%	1.01	1.20	0.18	1.00	1.37	0.37
75%	1.09	1.30	0.30	1.00	1.45	0.45
Max	1.33	1.71	0.71	1.00	1.79	0.79

Table 29: Economies of scale for exactly stable couples

	Stable						Naive					
	Female			Male			Female			Male		
	Min	Max	Diff	Min	Max	Diff	Min	Max	Diff	Min	Max	Diff
Mean	0.48	0.63	0.15	0.52	0.64	0.12	0.30	0.68	0.38	0.32	0.70	0.38
Std. dev.	0.16	0.14	0.10	0.15	0.14	0.08	0.11	0.11	0.11	0.11	0.11	0.11
Min	0.02	0.13	0.00	0.07	0.16	0.00	0.00	0.25	0.12	0.00	0.29	0.12
25%	0.37	0.54	0.07	0.42	0.55	0.06	0.23	0.61	0.31	0.25	0.63	0.31
50%	0.48	0.64	0.13	0.52	0.65	0.11	0.30	0.68	0.37	0.32	0.70	0.37
75%	0.59	0.72	0.20	0.62	0.74	0.17	0.37	0.75	0.45	0.39	0.77	0.45
Max	0.92	0.96	0.57	0.99	0.99	0.56	0.71	1.00	0.79	0.75	1.00	0.79

Table 30: RICEBs for exactly stable couples

F.3 Public Consumption of Leisure

As a further robustness check, we consider the scenario in which a fraction of leisure is allowed to be publicly consumed (reflecting externalities). Specifically, instead of assuming that all leisure is privately consumed, we now put upper bounds of 5, 10 and 15% on the degree of publicness of male and female leisure (i.e. we set $A_{leisure} \leq 5\%, 10\%$ and 15%). For example, using an upper bound of 15% means that at least 85% of leisure is privately consumed, while the remaining 15% can be privately and/or publicly consumed. In Table 32, we give the sample averages of the upper and lower bounds for our scale economies and individual RICEB measures under the three scenarios that we evaluate. We see two main effects when comparing these findings to the ones in Tables 3 and 6. First, our empirical rationalizability conditions become less restrictive when allowing for more public consumption, which naturally leads to wider bound estimates. Second, our scale economies and individual RICEBs generally increase, by construction. Table 33 gives the

	Economies of scale		Male RICEB		Female RICEB	
	interval	OLS	interval	OLS	interval	OLS
$\log(w_f/w_m)$	-0.00547	-0.00582*	-0.218***	-0.216***	0.213***	0.208***
	(0.00359)	(0.00325)	(0.00510)	(0.00458)	(0.00466)	(0.00517)
log(total income)	-0.0199***	-0.0399***	0.00734*	-0.00572	-0.0338***	-0.0357***
	(0.00637)	(0.00549)	(0.00408)	(0.00370)	(0.00583)	(0.00476)
Husband has college degree	0.0220**	0.00397	-0.0209***	-0.0150***	0.0329***	0.0197***
	(0.00877)	(0.00629)	(0.00541)	(0.00476)	(0.00714)	(0.00584)
One child	0.0498***	0.0518***	0.00380	0.0122***	0.0385***	0.0324***
	(0.00761)	(0.00531)	(0.00528)	(0.00409)	(0.00641)	(0.00478)
Two children	0.0459***	0.0498***	-0.000495	0.0127***	0.0388***	0.0368***
	(0.00613)	(0.00559)	(0.00538)	(0.00456)	(0.00548)	(0.00509)
>2 children	0.0624***	0.0715***	0.0146*	0.0238***	0.0364***	0.0438***
	(0.0104)	(0.00707)	(0.00768)	(0.00545)	(0.00948)	(0.00659)
$31 \leq age_m \leq 40$	-0.0170**	-0.00545	-0.0111**	-0.0118***	0.00964	0.00575
	(0.00814)	(0.00563)	(0.00514)	(0.00446)	(0.00687)	(0.00478)
$41 \leq age_m \leq 50$	-0.00411	0.0139**	-0.00303	0.00328	0.00775	0.00951*
	(0.00975)	(0.00647)	(0.00529)	(0.00508)	(0.00722)	(0.00526)
$51 \leq age_m \leq 60$	0.0124	0.0281***	-0.00632	0.00478	0.0162*	0.0187**
	(0.0106)	(0.00845)	(0.00770)	(0.00621)	(0.00834)	(0.00813)
$61 \leq age_m$	-0.00913	0.0257***	0.00704	0.0121*	-0.00569	0.00798
	(0.00956)	(0.00915)	(0.0110)	(0.00733)	(0.0101)	(0.00982)
Cohabitating	-0.00377	-0.00915	-0.00115	0.00305	-0.00434	-0.0125**
	(0.00726)	(0.00639)	(0.00522)	(0.00475)	(0.00759)	(0.00532)
Home owner	0.00938	-6.72e-05	0.00518	0.00110	0.00559	2.75e-05
	(0.00635)	(0.00549)	(0.00530)	(0.00431)	(0.00615)	(0.00505)
Metro area	-0.00809	-0.00279	-0.0113***	-0.00964**	0.00312	0.00531
	(0.00683)	(0.00527)	(0.00437)	(0.00398)	(0.00530)	(0.00446)
North Central	0.0269***	-0.00195	0.00133	-0.00387	0.00586	0.000569
	(0.00724)	(0.00598)	(0.00545)	(0.00455)	(0.00624)	(0.00496)
South	0.0142**	-0.0132**	-0.00498	-0.0134***	0.00940*	0.00483
	(0.00716)	(0.00595)	(0.00566)	(0.00419)	(0.00557)	(0.00513)
West	0.00631	0.000949	-0.00629	-0.00673	0.00842	0.00287
	(0.00649)	(0.00593)	(0.00557)	(0.00439)	(0.00635)	(0.00528)
$age_m - age_f$	-0.000386	-0.000958*	0.000710	0.000228	-0.00119**	-0.00128**
	(0.000620)	(0.000524)	(0.000543)	(0.000423)	(0.000598)	(0.000526)
$degree_m - degree_f$	-0.00211	-0.00772	0.000173	-0.00266	-0.00233	-0.00402
	(0.00711)	(0.00542)	(0.00421)	(0.00381)	(0.00622)	(0.00488)
Constant	1.233***	1.436***	0.511***	0.623***	0.791***	0.829***
	(0.0487)	(0.0443)	(0.0327)	(0.0293)	(0.0450)	(0.0369)
Observations	730	730	730	730	730	730
R-squared		0.269		0.927		0.890

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 31: Economies of scale, RICEBs and household characteristics for exactly stable couples

corresponding regression results, which can be compared to the ones in Tables 5 and 8. Once more, the different exercises lead to the same qualitative conclusions.

	Economies of scale			Male RICEB			Female RICEB		
Upper bound	Min	Max	Diff	Min	Max	Diff	Min	Max	Diff
0.05	1.0653	1.2178	0.1526	0.5547	0.6565	0.1018	0.4720	0.5979	0.1259
0.10	1.0746	1.2540	0.1795	0.5576	0.6726	0.1149	0.4750	0.6199	0.1449
0.15	1.0857	1.2912	0.2055	0.5605	0.6884	0.1279	0.4809	0.6423	0.1614

Table 32: Average scale economies and individual RICEBs with public consumption of leisure

F.4 Conditioning the Individuals' Repartnering Options

We next check sensitivity of our conclusions with respect to our assumption that each individual in our sample considers all the individuals of the other gender in our constructed marriage markets (based on age, education, region and number of children) as possible remarriage partners. Particularly, we define potential partners by conditioning on a rich/poor categorization. To do so, we label a household as rich if its total labor income exceeds the median labor income for our sample of households, while households with below-median labor income are labeled as poor. Then, we assume that an individual will only consider other individuals in the same (rich/poor) income category as potential remarriage partners. While we condition the repartnering options, we do preserve the assumption that observably similar households (in terms of age, education, region and number of children) are characterized by a homogeneous consumption technology.

Table 34 summarizes the estimated bounds for our scale economies and individual RICEB measures. These bounds are slightly wider than in our baseline empirical setting, which we summarized in Tables 3 and 6 in the main text. This could actually be expected because reducing the number of potential partners leads to less competition on the marriage market, which implies weaker restrictions on possible intrahousehold allocations (under marital stability). Table 35 shows the associated regression estimates, which can be compared to the results in Tables 5 and 8. Again, our main qualitative conclusions turn out to be robust.

F.5 Singles As Potential Remarriage Partners

As final robustness check, we assess the impact of including singles as potential remarriage partners for married individuals. Our sample of singles is subject to the same selection criteria as our sample of couples. Table 36 presents the associated summary statistics. Similar to before, we assign singles to different marriage markets on the basis of their age, education level and region of residence. However, we do not partition our sample of singles based on the number of children, which implies that each single constitutes a remarriage option for married individuals in at most four different marriage markets (characterized by 0, 1, 2 or at least 3 children for the married individual).

In what follows, we will present two sets of results, which correspond to two different assumptions regarding the consumption technology of singles. In our first exercise, we use the assumption

	Economies of scale			Male RICEB			Female RICEB		
	a <5%	a <10%	a <15%	a <5%	a <10%	a <15%	a <5%	a <10%	a <15%
$\log(w_f/w_m)$	0.00273	0.000911	-0.000353	-0.202***	-0.197***	-0.192***	0.204***	0.198***	0.191***
	(0.00204)	(0.00175)	(0.00176)	(0.00286)	(0.00290)	(0.00292)	(0.00292)	(0.00281)	(0.00285)
log(total income)	-0.0216***	-0.0174***	-0.0111***	0.0126***	0.0157***	0.0218***	-0.0342***	-0.0313***	-0.0317***
	(0.00422)	(0.00391)	(0.00395)	(0.00398)	(0.00426)	(0.00406)	(0.00458)	(0.00454)	(0.00460)
Husband has degree	0.0139***	0.0233***	0.0254***	-0.0246***	-0.0233***	-0.0224***	0.0284***	0.0324***	0.0344***
	(0.00529)	(0.00508)	(0.00521)	(0.00411)	(0.00438)	(0.00442)	(0.00504)	(0.00508)	(0.00539)
One child	0.0402***	0.0395***	0.0409***	0.0152***	0.0160***	0.0163***	0.0218***	0.0191***	0.0162***
	(0.00554)	(0.00528)	(0.00636)	(0.00405)	(0.00415)	(0.00423)	(0.00457)	(0.00468)	(0.00534)
Two children	0.0448***	0.0221***	0.0302***	0.0106**	0.00689	0.00682	0.0339***	0.0236***	0.0265***
	(0.00520)	(0.00496)	(0.00581)	(0.00429)	(0.00445)	(0.00463)	(0.00435)	(0.00439)	(0.00473)
> 2 children	0.0305***	0.0163**	0.0109	0.0170***	0.0184***	0.0178***	0.0183***	0.0122*	0.00686
	(0.00738)	(0.00709)	(0.00779)	(0.00581)	(0.00601)	(0.00620)	(0.00667)	(0.00693)	(0.00724)
$31 \leq age_m \leq 40$	-0.00555	-0.00136	-0.00910	-0.00211	-0.00298	-0.00324	-0.00113	-0.000422	-0.00492
	(0.00498)	(0.00476)	(0.00655)	(0.00414)	(0.00423)	(0.00426)	(0.00469)	(0.00479)	(0.00521)
$41 \leq age_m \leq 50$	-0.00576	-0.0120**	-0.0213***	-0.00282	-0.00387	-0.00540	-0.00356	-0.0141***	-0.0187***
	(0.00610)	(0.00567)	(0.00744)	(0.00479)	(0.00506)	(0.00516)	(0.00543)	(0.00545)	(0.00596)
$51 \leq age_m \leq 60$	0.0149***	0.0101**	0.00735	0.00491	0.00225	0.00330	0.00657	0.00169	-0.00466
	(0.00536)	(0.00483)	(0.00539)	(0.00542)	(0.00544)	(0.00550)	(0.00558)	(0.00557)	(0.00568)
$61 \leq age_m$	-0.0256***	-0.0304***	-0.0432***	0.0140**	0.0152**	0.00906	-0.0372***	-0.0418***	-0.0467***
	(0.00516)	(0.00525)	(0.00500)	(0.00622)	(0.00698)	(0.00592)	(0.00650)	(0.00615)	(0.00619)
Cohabitating	0.00248	0.00410	0.00130	-0.00124	-0.00167	-0.000865	0.00137	0.00204	0.00133
	(0.00571)	(0.00542)	(0.00527)	(0.00391)	(0.00403)	(0.00422)	(0.00503)	(0.00485)	(0.00518)
Home owner	0.00846**	0.00785**	0.00520	-0.00163	-0.00171	-0.00175	0.0102***	0.00944**	0.00932**
	(0.00386)	(0.00354)	(0.00357)	(0.00355)	(0.00389)	(0.00366)	(0.00388)	(0.00375)	(0.00387)
Metro area	-0.00459	-0.00284	0.000260	-0.00791**	-0.00728**	-0.00502	0.00301	0.00326	0.00347
	(0.00409)	(0.00356)	(0.00339)	(0.00311)	(0.00323)	(0.00312)	(0.00380)	(0.00362)	(0.00374)
North Central	-0.0197***	-0.0290***	-0.0191***	-0.0214***	-0.0306***	-0.0275***	0.00365	0.0141***	0.0153***
	(0.00542)	(0.00579)	(0.00580)	(0.00453)	(0.00508)	(0.00466)	(0.00523)	(0.00489)	(0.00496)
South	0.00141	-0.00299	0.00493	-0.0191***	-0.0275***	-0.0256***	0.0179***	0.0286***	0.0297***
	(0.00520)	(0.00551)	(0.00538)	(0.00413)	(0.00463)	(0.00419)	(0.00469)	(0.00426)	(0.00434)
West	-0.0198***	-0.0362***	-0.0274***	-0.0202***	-0.0280***	-0.0258***	0.00813	0.0135**	0.0158***
	(0.00549)	(0.00582)	(0.00662)	(0.00494)	(0.00539)	(0.00520)	(0.00574)	(0.00538)	(0.00557)
$age_m - age_f$	-0.000417	-8.80e-05	-3.63e-05	0.000657*	0.000710*	0.000916**	-0.000812*	-0.000700*	-0.000680
	(0.000399)	(0.000374)	(0.000374)	(0.000391)	(0.000419)	(0.000422)	(0.000438)	(0.000411)	(0.000420)
$degree_m - degree_f$	0.00368	-3.15e-05	-0.000513	0.000703	-7.32e-05	0.000321	0.00317	0.00117	0.00151
	(0.00376)	(0.00343)	(0.00343)	(0.00344)	(0.00365)	(0.00357)	(0.00406)	(0.00396)	(0.00412)
Constant	1.282***	1.275***	1.243***	0.475***	0.465***	0.419***	0.818***	0.801***	0.823***
	(0.0335)	(0.0320)	(0.0314)	(0.0325)	(0.0356)	(0.0335)	(0.0363)	(0.0359)	(0.0362)
Observations	1,138	1,138	1,138	1,138	1,138	1,138	1,138	1,138	1,138

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 33: Economies of scale, individual RICEBs and household characteristics with public consumption of leisure

	Economies of scale			Female RICEB			Male RICEB		
	Min	Max	Diff	Min	Max	Diff	Min	Max	Diff
Mean	1.0544	1.1979	0.1435	0.4582	0.5858	0.1277	0.5511	0.6580	0.1068
Std. dev.	0.0634	0.1296	0.1613	0.1713	0.1709	0.1036	0.1772	0.1546	0.0859
Min	1.0000	1.0009	0.0000	0.0106	0.0731	0.0000	0.0664	0.1465	0.0000
25%	1.0000	1.0949	0.0000	0.3372	0.4776	0.0446	0.4312	0.5629	0.0397
50%	1.0295	1.1725	0.0909	0.4592	0.6075	0.1037	0.5408	0.6732	0.0888
75%	1.0955	1.2768	0.2620	0.5713	0.7083	0.1938	0.6704	0.7667	0.1606
Max	1.3268	1.7362	0.7362	0.9199	0.9829	0.6471	0.9886	0.9894	0.5652

Table 34: Economies of scale and individual RICEBs when conditioning the individuals' options

	Economies of scale		Female RICEB		Male RICEB	
	Interval	OLS	Interval	OLS	Interval	OLS
$\log(w_f/w_m)$	0.00103	0.000510	0.207***	0.203***	-0.205***	-0.203***
	(0.00240)	(0.00227)	(0.00296)	(0.00308)	(0.00290)	(0.00280)
log(total income)	-0.0299***	-0.0379***	-0.0247***	-0.0302***	-0.00356	-0.0126***
	(0.00498)	(0.00450)	(0.00492)	(0.00398)	(0.00412)	(0.00361)
Husband has degree	-0.0130*	-0.0169***	0.0125**	0.00792*	-0.0261***	-0.0224***
	(0.00693)	(0.00526)	(0.00541)	(0.00463)	(0.00422)	(0.00385)
One child	0.0476***	0.0564***	0.0256***	0.0288***	0.0156***	0.0215***
	(0.00690)	(0.00466)	(0.00508)	(0.00407)	(0.00437)	(0.00360)
Two children	0.0477***	0.0565***	0.0376***	0.0378***	0.0105**	0.0198***
	(0.00621)	(0.00488)	(0.00472)	(0.00436)	(0.00442)	(0.00393)
> 2 children	0.0158*	0.0521***	0.0125*	0.0301***	0.00682	0.0196***
	(0.00820)	(0.00632)	(0.00747)	(0.00598)	(0.00565)	(0.00479)
$31 \leq age_m \leq 40$	0.00329	-0.00244	0.00178	0.00110	-0.000635	-0.00264
	(0.00597)	(0.00462)	(0.00526)	(0.00404)	(0.00462)	(0.00391)
$41 \leq age_m \leq 50$	0.0111	0.0138**	0.00147	0.00488	0.00357	0.00515
	(0.00767)	(0.00570)	(0.00595)	(0.00479)	(0.00521)	(0.00454)
$51 \leq age_m \leq 60$	0.0206***	0.0263***	0.00399	0.0110*	0.00708	0.0126**
	(0.00627)	(0.00636)	(0.00599)	(0.00588)	(0.00601)	(0.00528)
$61 \leq age_m$	-0.0181***	-0.00162	-0.0252***	-0.0141**	0.00557	0.00841
	(0.00574)	(0.00621)	(0.00710)	(0.00673)	(0.00655)	(0.00558)
Cohabitating	-0.00426	-0.00933*	0.00313	-0.00537	-0.00776*	-0.00457
	(0.00646)	(0.00542)	(0.00559)	(0.00426)	(0.00445)	(0.00417)
Home owner	0.00860*	0.00318	0.0105**	0.00483	-0.00245	-0.000186
	(0.00492)	(0.00451)	(0.00438)	(0.00393)	(0.00392)	(0.00349)
Metro area	-0.00233	0.00166	0.00263	0.00747**	-0.00562*	-0.00589*
	(0.00461)	(0.00421)	(0.00424)	(0.00356)	(0.00328)	(0.00316)
North Central	-0.00205	-0.0133***	0.00170	-0.00410	-0.00982**	-0.0102**
	(0.00549)	(0.00484)	(0.00535)	(0.00429)	(0.00468)	(0.00400)
South	0.000372	-0.0208***	0.00711	-0.000777	-0.0121***	-0.0171***
	(0.00499)	(0.00473)	(0.00480)	(0.00426)	(0.00441)	(0.00364)
West	0.00532	0.00236	0.0153***	0.00746	-0.00851*	-0.00565
	(0.00582)	(0.00526)	(0.00570)	(0.00480)	(0.00505)	(0.00413)
$age_m - age_f$	-0.000403	-0.000734	-0.000875*	-0.00112***	0.000939**	0.000294
	(0.000514)	(0.000449)	(0.000468)	(0.000409)	(0.000375)	(0.000358)
$degree_m - degree_f$	0.00446	-0.00153	-0.000988	-0.00275	0.00363	0.00162
	(0.00522)	(0.00447)	(0.00451)	(0.00390)	(0.00366)	(0.00325)
Constant	1.339***	1.429***	0.734***	0.791***	0.600***	0.679***
	(0.0394)	(0.0359)	(0.0387)	(0.0310)	(0.0328)	(0.0284)
Observations	1,138	1,138	1,138	1,138	1,138	1,138
R-squared		0.301		0.914		0.935

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 35: Economies of scale, individual RICEBs and household characteristics when the individuals' conditioning repartnering options

	Single males (n = 341)				Single females (n = 685)			
	Mean	Std. dev.	Min	Max	Mean	Std. dev.	Min	Max
Wage	23.10	15.77	3.47	106.44	20.59	13.46	2.69	81.52
Market work	43.50	11.33	10.00	110.00	40.27	10.41	10.00	100.00
Household work	7.26	7.37	0.00	50.00	9.92	8.40	0.00	50.00
Leisure	61.24	12.96	1.00	101.00	61.81	12.51	7.00	98.00
Age	38.74	13.27	19.00	86.00	38.74	12.73	19.00	78.00
Children	0.17	0.54	0.00	4.00	0.76	1.01	0.00	5.00
Consumption	650.56	325.17	57.77	2561.69	672.29	372.47	69.27	4634.42

Table 36: Sample summary statistics for singles

that all households (including both singles and couples) in the same marriage market have a homogeneous consumption technology (characterized by a common technology matrix A).[31] In our second exercise, we allow for more flexibility by including the possibility that singles and couples have different consumption technologies. In this case, all couples in the same marriage market are characterized by a technology matrix A (as in our baseline empirical analysis) and all singles in the same market are characterized by a technology matrix B, which may well differ from A.

The two technology assumptions give rise to different no blocking pair restrictions. To show this, we first consider the case with singles and couples (in the same marriage market) sharing a homogeneous consumption technology. Following a reasoning similar to the one leading up to Proposition 1, the rationalizability restrictions corresponding to the potentially blocking pair consisting of the married male m and single female f now takes the form[32]

$$\begin{aligned} q^m_{m,\sigma(m)} + q^{\sigma(m)}_{m,\sigma(m)} &= (I - A) q_{m,\sigma(m)}, \\ q^f_{\phi,f} &= (I - A) q_{\phi,f}, \\ y_{m,f} &\leq p_{m,f}(q^m_{m,\sigma(m)} + q^f_{\phi,f}) + p_{m,f} A \max\{q_{m,\sigma(m)}, q_{\phi,f}\}. \end{aligned} \tag{8}$$

Next, let us consider the scenario in which singles and couples can have different technologies. In this case, the no blocking pair restrictions corresponding to the married male m with technology matrix A and the single female f with technology matrix B are defined as

$$\begin{aligned} q^m_{m,\sigma(m)} + q^{\sigma(m)}_{m,\sigma(m)} &= (I - A) q_{m,\sigma(m)}, \\ q^f_{\phi,f} &= (I - B) q_{\phi,f}, \\ y_{m,f} &\leq p_{m,f} q^m_{m,\sigma(m)} + p_{m,f} q^f_{\phi,f} + p_{m,f} A q_{m,\sigma(m)} + p_{m,f} B q_{\phi,f}. \end{aligned} \tag{9}$$

[31] Admittedly, the distinction between public and private consumption is somewhat artificial in the case of singlehood. Evidently, all consumption is private by construction under single status. However, in our setting the distinction between public and private consumption of singles is useful. It allows us to model that the "public" component Aq of a single's current consumption bundle can be shared with a new partner in case of (re)marriage (see the no blocking pair restrictions (8)).

[32] The restrictions for a potentially blocking pair with married female f and single male m are constructed in a directly similar fashion.

Table 37 reports the sample averages of the upper and lower bounds for our scale economies and individual RICEB measures for the two exercises (with "same" and "different" technologies for singles and couples). A first observation is that, for both exercises, these average bounds are tighter than to the ones of our main empirical analysis, which did not include singles. This tightening makes intuitive sense: including singles implies a larger marriage market and, thus, increased marital competition, which in turn yields more precise identification of intrahousehold allocation patterns (when exploiting the assumption of stable marriage). Next, the scenario that allows couples and singles to have different consumption technologies generally yields wider bounds than the scenario with common technologies. The explanation is that the no blocking pair restrictions in equation (9) are weaker in nature than the restrictions in equation (8), reflecting the weaker homogeneity assumption. Further, the scale economies and RICEB estimates under the assumption that singles and couples share a common consumption technology are generally lower than the estimates in our baseline empirical exercise. We interpret this as reflecting that the technology matrix A now also applies to singles (because of the common technology assumption), and rationalizing singles' behavior requires that scale economies are sufficiently low. Finally, the regressions in Table 38 relate these estimates to observable household characteristics. Like before, our main qualitative conclusions based on Tables 5 and 8 are generally unaffected.

	Technology	Min	Max	Diff
	Same	1.0248	1.0574	0.0326
Economies of scale	Different	1.0611	1.1797	0.1187
	Same	0.4455	0.4939	0.0484
Female RICEB	Different	0.4720	0.5738	0.1019
	Same	0.5480	0.5971	0.0492
Male RICEB	Different	0.5552	0.6380	0.0829

Table 37: Average scale economies and individual RICEBs with singles included

	Same consumption technology			Different consumption technology		
	Scale	Male RICEB	Female RICEB	Scale	Male RICEB	Female RICEB
$\log(w_f/w_m)$	-0.00523***	-0.226***	0.221***	-0.00156	-0.208***	0.206***
	(0.00145)	(0.00308)	(0.00306)	(0.00212)	(0.00296)	(0.00305)
log(total income)	0.00105	-0.00190	0.00122	-0.0412***	-0.00424	-0.0370***
	(0.00278)	(0.00346)	(0.00352)	(0.00422)	(0.00356)	(0.00402)
Husband has college degree	-0.00773**	-0.0173***	0.00833**	-0.00255	-0.0208***	0.0181***
	(0.00326)	(0.00369)	(0.00381)	(0.00489)	(0.00384)	(0.00457)
One child	0.00861***	0.00867**	0.000885	0.0559***	0.0222***	0.0286***
	(0.00332)	(0.00353)	(0.00368)	(0.00464)	(0.00374)	(0.00409)
Two children	0.0190***	0.0146***	0.00601*	0.0599***	0.0215***	0.0365***
	(0.00324)	(0.00394)	(0.00360)	(0.00484)	(0.00405)	(0.00450)
>2 children	0.0150***	0.00607	0.00982**	0.0560***	0.0185***	0.0354***
	(0.00416)	(0.00441)	(0.00480)	(0.00606)	(0.00491)	(0.00555)
$31 \leq age_m \leq 40$	-0.0137***	-0.00933**	-0.00480	-0.00842*	-0.0106***	0.00274
	(0.00348)	(0.00386)	(0.00365)	(0.00453)	(0.00407)	(0.00405)
$41 \leq age_m \leq 50$	-0.0112***	-0.00392	-0.00716*	0.00535	0.000987	0.00393
	(0.00416)	(0.00448)	(0.00419)	(0.00557)	(0.00470)	(0.00491)
$51 \leq age_m \leq 60$	-0.000731	0.00458	-0.00500	0.0243***	0.00744	0.0149**
	(0.00438)	(0.00499)	(0.00523)	(0.00588)	(0.00512)	(0.00579)
$61 \leq age_m$	-0.00411	0.0134**	-0.0155***	0.0186***	0.0249***	-0.0106
	(0.00407)	(0.00582)	(0.00576)	(0.00580)	(0.00564)	(0.00674)
Cohabitating	-0.00427	0.000318	-0.00579	-0.00266	0.00146	-0.00546
	(0.00361)	(0.00393)	(0.00358)	(0.00534)	(0.00418)	(0.00454)
Home owner	-0.00319	-0.00388	-0.000620	0.00230	-0.00185	0.00436
	(0.00299)	(0.00339)	(0.00336)	(0.00437)	(0.00356)	(0.00405)
Metro area	-0.000205	-0.00610**	0.00616**	0.00354	-0.00523*	0.00752**
	(0.00266)	(0.00298)	(0.00299)	(0.00386)	(0.00317)	(0.00349)
North Central	-0.00316	-0.0111***	0.00690*	-0.0129***	-0.0147***	0.00187
	(0.00315)	(0.00375)	(0.00366)	(0.00488)	(0.00403)	(0.00435)
South	-0.00474	-0.0144***	0.00771**	-0.0152***	-0.0172***	0.00480
	(0.00292)	(0.00337)	(0.00350)	(0.00457)	(0.00359)	(0.00428)
West	0.000934	-0.00648	0.00673*	0.00117	-0.00726*	0.00584
	(0.00321)	(0.00400)	(0.00398)	(0.00513)	(0.00420)	(0.00483)
$age_m - age_f$	-0.000106	0.000641*	-0.000753**	-0.000779*	0.000410	-0.00119***
	(0.000303)	(0.000358)	(0.000346)	(0.000414)	(0.000360)	(0.000405)
$degree_m - degree_f$	-0.00136	0.00192	-0.00313	-0.00606	-0.00301	-0.00221
	(0.00277)	(0.00317)	(0.00334)	(0.00399)	(0.00323)	(0.00379)
Constant	1.041***	0.559***	0.499***	1.438***	0.602***	0.838***
	(0.0223)	(0.0274)	(0.0275)	(0.0340)	(0.0284)	(0.0314)
Observations	1,138	1,138	1,138	1,138	1,138	1,138
R-squared	0.083	0.949	0.944	0.274	0.936	0.918

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 38: Economies of scale, individual RICEBs and household characteristics with singles included