MIGRATION IN CHINA: TO WORK OR TO WED?

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ABSTRACT. This paper develops a model encompassing both matching and hedonic models, studies its properties and provides identification and estimation strategies. We bring the model to data on internal migration in China to answer the question raised in the title. We estimate the migration surplus of singles and couples and the marital surplus of natives and, using counterfactuals together with our identification strategy, quantify the "marrying-up" and the "work" effects of migration. Results show that, for floating (resp. permanent) migrant women married with urban men, the "marrying-up" effect is positive but 3.5 (resp. 5) times smaller than the "work" effect. However, as these migrant women enter the urban marriage market, they generate equilibrium "marrying-up" effects for *all* men and women by changing the relative supply of women on both the rural and urban marriage markets. These effects can be large relative to the "work" effect of migration for some types of migrants (floating migrant women married with a permanent migrant man and floating migrant women married with a floating migrant man) and represent about 13% of the equilibrium utility of urban native men.

Keywords: Sorting in many local markets, marriage market, hedonic and matching models.

JEL Classification: D3, J21, J23 and J31.

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1. Introduction

Migration is an important aspect of most economies. In China and the USA, for instance, millions of individuals move every year from rural to urban locations or across states. While there are many motives for migration, work-related motives have received most of the attention in the literature. Yet, a recent emerging literature points towards marital motives as an important source of migration. For instance, Weiss, Yi and Zhang (2018) explains that distributional imbalances across regions, such as the economic gap between Hong Kong and mainland China, can induce significant welfare effects through marriage patterns.[1]

This paper aims at answering the question raised in the title by quantifying the relative importance of work and marital motives of migration. To this aim, we develop a structural marriage matching model encompassing both the marriage matching model by Becker (1973) and Shapley and Shubik (1971), along with the hedonic model of Tinbergen (1956) and Rosen (1974). The starting point of our model is the observation that, for couples, the migration decision is a *joint* decision. In our model, couples will choose the destination that maximizes the joint satisfaction of both spouses, i.e. the sum of the man's and the woman's. Our model therefore has the flavor of a matching model, where individuals care about their partner's attributes; it boils down to a matching model when there is no joint decision to take, i.e. if migration is not an option. However, our model also has the flavor of a hedonic model, as the two sides of the market jointly choose a quality characteristic; it boils down to a classical hedonic model when individuals do not care about their partners' characteristics, but only about the joint decision.

As we shall see, our setting is in fact a natural extension of both the matching and the hedonic model. This class of models has received little attention in the literature,[2] and bridging the gap between hedonic models and matching models in a unified model is the main methodological contribution of this paper. This paper characterizes stability and investigates a closely related notion of equilibrium.

In the model, men and women are initially distributed over various locations indicating their birthplace. To each location corresponds a local marriage market. In the

[1]A different argument is put forward in Gautier et al. (2010), who argue that cities can act as more efficient marriage markets because of their density and hence attract migration from rural areas.

[2]See Dupuy (2010) and Quintana-Domeque (2011).

model, individuals choose which local marriage market to enter, with the option to remain single, and where to live. The choice of which local marriage market to enter affects whether one marries and with whom as the relative supply of types of men and women may vary across local marriage markets. Likewise, the choice of where to live affects individuals' utility as job opportunities and hedonic enjoyment (i.e. derived from public goods such as theaters, opera house etc.) may vary across locations. As a result, the net benefits of migration are individual-specific, depend on observable (by the analyst) and unobservable attributes, and may materialize through 3 different channels:

(1) different job opportunities at destination, i.e. the "work" effect and,
(2) different hedonic enjoyment at destination, i.e. the "hedonic enjoyment" effect and,
(3) different opportunities on the destination's marriage market, i.e. the "marrying-up" effect.

To answer the question in the title requires identification of the "work" and "marrying-up" effects. Nevertheless, we provide identification results for these three effects of migration. First, the "work" effect of migration is identified using single migrants. Indeed, under the assumption that for singles the additional hedonic enjoyment at destination is relatively negligible compared to the utility derived from job opportunities at destination, the migration surplus of singles identifies their "work" effect of migration.

Second, the joint "hedonic enjoyment" effect of migration for married couples is identified using migrant couples, i.e. couples with two migrant spouses, and native couples at origin. The difference in the marital surplus between these two types of couples identifies the "marriage hedonic enjoyment" effect of migration once one has accounted for the "work" effect.

Third, the "marrying-up" effect of migration is identified using mixed-couples, i.e. couples with one migrant spouse and one native spouse. Indeed, since mixed-couples could not have formed unless the migrant spouses entered the native spouses' marriage market, and since the migrant spouses had the option to enter their birthplace marriage market, it must mean these migrant spouses entered the destination marriage market to marry-up. Hence, part of the expected indirect utility of agents in the economy must be due to the "marrying-up" effect. To quantify this effect, one can simply compute the expected indirect utilities of agents in the observed market, i.e. with observed mixed-couples, and compare these with the expected indirect utilities computed in an otherwise identical marriage market except that entering the destination's local marriage market is impossible, hence without mixed-couples.[3] The difference between the former and latter expected indirect utilities quantifies the "marrying-up" effect of migration. It is important to note that this latter effect is an equilibrium effect so that not only migrants but also natives are concerned as the supply of men and women on each local marriage market differ in the two situations.

We parameterize the marriage surplus of couples and the migration surplus of singles and couples and estimate the parameters using a matching moment estimator and data from the Rural Urban Migration in China (RUMiC) longitudinal dataset. We then apply our identification strategy and compute the "work" effect and the "marrying-up" effect and hence provide a quantification of the extent to which people migrate to work or to wed, answering herewith the question raised in the title.

Results show that the "marrying-up" effect is positive for migrant women in mixed-couples but between 3.5 and 5 times smaller than the "work" effect. Interestingly, as migrant women in mixed-couples enter the urban marriage market, they generate equilibrium "marrying-up" effects for all men and women by changing the relative supply of women both on the rural and urban marriage markets. These effects can be large relative to the "work" effect of migration for some types of migrants. For urban native men, these effects represent roughly 13% of their expected indirect utility.

Relation to the literature. As previously noted, the model we introduce here relates on the one hand to the classical Becker model (Becker 1973, Shapley and Shubik, 1971). Empirical analysis on the Becker model was greatly facilitated by the analysis of Choo and Siow (2006), who superimpose a discrete choice structure on the model of matching. We will show how to extend Choo and Siow's insight in our generalized setting. On the other hand, the paper connects to the literature on hedonic models, started by Tinbergen (1956), pursued by Rosen (1974), and revived by Ekeland et al. (2004).

[3]This can be done by setting the marriage surplus of mixed-couples equal to $-\infty$. We shall see that this is equivalent to a situation where the meeting rate between individuals originally from different locations is equal to zero. It is important to note that this restriction does not prevent individuals to migrate either as singles or as a couple of migrants.

The encompassing matching model relates to Mourifié and Siow (2014) and Jaffe and Weber (2019) who respectively study peer effects and differential meeting rates in matching markets. In these models, peer effects and meeting rates affect equilibrium matching by reducing individuals' choice set. In the encompassing model, migration plays a similar role, it affects equilibrium matching on the local marriage markets by changing individuals' choice set.

Our point of view differs from a number of papers, such as Chiappori et al. (2017), Lafortune (2013), McCann et al. (2015) and Zhang (2014), who address the connection between the marriage market and the labor market and examine how agents invest in human capital prior to entering a matching market. We do not model the matching on the labor market and take human capital as given and exogenous.

There is a growing literature using natural experiments or instrumental variable approach to quantify the "marrying-up" effect of sex-ratios differences on the marriage market (Angrist, 2002, Porter, 2007, Abramitzky et al., 2011 for instance). A related literature also analyzes the effects of sex ratios differences on the labor market (Angrist, 2002, Chang and Zhang, 2012, Amuedo-Dorantes and Grossbard, 2008). We contribute to this literature by considering how variations in local marriage market conditions (sex ratios but also more generally the distribution of types of men and women) and labor market conditions affect migration and matching on the marriage market.

Our application to rural-urban migration in China also relates to work by Ying et al. (2014) about the recent increase in inter-province marriages among migrants, to Nie and Xing (2010) that document the impact of a change in the attribution of a Hukou (resident permit in China) on inter Hukou marriages and Banerjee et al. (2013) that study inter castes marriages in India.

The outline for the rest of the paper is as follows. Section 2 introduces the encompassing matching model and presents our identification, inference and computation strategy. Section 3 describes the data and section 4 discusses the parametric specification and empirical results. Section 5 summarizes and concludes.

2. Encompassing matching and hedonic models

We present the encompassing model using the specific context of migration in China. Note however that the main features of the model, i.e. Theorem 1, apply to other contexts as those listed in the last paragraph of the conclusion.

2.1. Equilibrium and identification.

We consider a population of men and women who differ by various characteristics including age, education (taken as exogenous), health and physical characteristics, and also birthplace. We shall model two decisions of these individuals: whom to marry (with the option to remain single) and where to live. These decisions obviously are not independent.

Let $x_i \in \mathcal{X} = \mathbb{R}^{d_x}$ denote the vector of observable type of a man i, and let $y_j \in \mathcal{Y} = \mathbb{R}^{d_y}$ denote the observable type of woman j. The vectors x and y include socioeconomic and physical attributes, but also record the birthplace, as we assume that men and women were initially born and raised over various locations. Let $\mathcal{Z}$ be the (finite) set of locations. We let $Z(x)$ and $Z(y)$ denote the birthplace of a man of type x and a woman of type y, respectively.

To each location corresponds a local marriage market. Agents have the option to marry a member of the opposite sex from any local marriage market or to remain single; the set of marital options available to men is therefore $\mathcal{Y}_0 = \mathcal{Y} \cup \{0\}$, where 0 is the option of singlehood; and the set of marital options available to women is $\mathcal{X}_0 = \mathcal{X} \cup \{0\}$, where 0 is singlehood again.

A household type is the specification of the observable types of the partners (or of the single member if it is a single household) and the living location chosen by this household. Hence, the set of household types is $\mathcal{XYZ}_0 = \mathcal{XY}_0 \times \mathcal{Z}$ with $\mathcal{XY}_0 = (\mathcal{X} \times \mathcal{Y} \cup \mathcal{X}_0 \cup \mathcal{Y}_0)$.

We assume that if a man of type x and a woman of type y marry and live in location z, they enjoy respective utilities

$$\alpha(x, y, z) + t(x, y, z) + \varepsilon(y, z)$$
$$\gamma(x, y, z) - t(x, y, z) + \eta(x, z)$$

while if they remain unmatched, they enjoy respectively payoffs

$$\alpha(x, 0, z) + \varepsilon(0, z) \text{ and } \gamma(0, y, z) + \eta(0, z)$$

where:

- $t(x,y,z)$ is the marital utility transfer (positive or negative) in market z from a woman of type y to a man of type x. This is an endogenous quantity which is determined at equilibrium and depends deterministically on x, y and z.[4]
- $\alpha(x,y,z)$ (respectively, $\gamma(x,y,z)$) is an exogenous term that accounts for the combination of marital *and* labor market utility of the man (respectively of the woman).
- for every man, $\varepsilon(.,.)$ (respectively, for every women, $\eta(.,.)$) is an idiosyncratic term modelled as a Gumbel random process on $\mathcal{Y}_0 \times \mathcal{Z}$ (respectively on $\mathcal{X}_0 \times \mathcal{Z}$) expressing the preference heterogeneity of men and women, respectively.[5]

Note that the encompassing model nests both the matching model and the hedonic model. The matching model obtains when agents do not care about the hedonic attribute, i.e. here the location z, so that $\alpha(x,y,z) = \alpha(x,y)$, $\gamma(x,y,z) = \gamma(x,y)$, $\varepsilon(y,z) = \varepsilon(y)$ and $\eta(x,z) = \eta(x)$. As a result, the equilibrium transfers obtain as: $t(x,y,z) = t(x,y)$. In contrast, the hedonic model arises when agents' utilities do not depend on the attributes of their potential spouses so that $\alpha(x,y,z) = \alpha(x,z)$, $\gamma(x,y,z) = \gamma(y,z)$, $\varepsilon(y,z) = \varepsilon(z)$ and $\eta(x,z) = \eta(z)$. In that case, the equilibrium transfers obtain as $t(x,y,z) = t(z)$ and is interpreted as the equilibrium price for the hedonic attribute z.

Without loss of generality, we normalize the systematic utility of non-migrant single individuals to zero, i.e.

$$\alpha(x,0,Z(x)) = \gamma(0,y,Z(y)) = 0,$$

which allows us to refer to $\alpha(x,y,z)$ and $\gamma(x,y,z)$ in terms of surplus rather than utility.

Note that the transfer between spouses enters additively and with opposite sign in their respective surplus. As a result, transfers cancel each other out in the expression of the joint surplus to yield

$$\alpha(x,y,z) + \gamma(x,y,z) =: \Phi(x,y,z).$$

Let $f(x)$ be the mass density of men of type x and $g(y)$ the mass density of women of type y. For every $(x,y,z) \in \mathcal{XYZ}_0$, we define $\mu(x,y,z)$ as the mass density of a

[4]As shown in Theorem 1 (i) below, it is a property of the equilibrium, given our assumptions, that transfers only depend on (z,x,y) and not on the identity of spouses (i,j).

[5]Gumbel random processes are defined in online Appendix A; they were introduced by Cosslett (1988) and Dagsvik (1994), and used in a matching context by Dupuy and Galichon (2014).

household of type (x,y,z). It follows that the mass density of matched men of type x reads as $\int_{\mathcal{Y}\times\mathcal{Z}}\mu(x,y,z)dydz$ which by definition has to be lower or equal to $f(x)$ the mass density of men of type x. A similar constraint holds for matched women of type y. This motivates the following definition of a feasible matching.

Definition 1. *A feasible matching in this economy is*

$$\mathcal{M}(f,g)=\left\{\mu\geq 0:\int_{\mathcal{Y}_0\times\mathcal{Z}}\mu(x,y,z)dydz\leq f(x)\ \text{and}\ \int_{\mathcal{X}_0\times\mathcal{Z}}\mu(x,y,z)dxdz\leq g(y)\right\}.$$

A man of type x and a woman of type y choose both their partner's type and place to live, which yields respectively

$$\max_{(y,z)\in\mathcal{Y}_0\times\mathcal{Z}}\left\{\alpha(x,y,z)+t(x,y,z)+\varepsilon(y,z)\right\} \tag{2.1}$$

$$\max_{(x,z)\in\mathcal{X}_0\times\mathcal{Z}}\left\{\gamma(x,y,z)-t(x,y,z)+\eta(x,z)\right\}, \tag{2.2}$$

where $t(x,0,z)=t(0,y,z)=0$ for all $(x,z)\in\mathcal{X}\times\mathcal{Z}$ and $(y,z)\in\mathcal{Y}\times\mathcal{Z}$.

Note that given a transfer function t, the optimal choice of a man of type x is a random variable $(Y^x,Z^x)\in\mathcal{Y}_0\times\mathcal{Z}$, such that (Y^x,Z^x) is optimal for (2.1), that is

$$(Y^x,Z^x)\in\arg\max_{(y,z)\in\mathcal{Y}_0\times\mathcal{Z}}\left\{\alpha(x,y,z)+t(x,y,z)+\varepsilon(y,z)\right\}$$

and similarly, the optimal choice of a woman of type y is a random variable $(X^y,Z^y)\in\mathcal{X}_0\times\mathcal{Z}$, which is optimal for (2.2), that is

$$(X^y,Z^y)\in\arg\max_{(x,z)\in\mathcal{X}_0\times\mathcal{Z}}\left\{\gamma(x,y,z)-t(x,y,z)+\eta(x,z)\right\}.$$

It follows that at equilibrium, the matching μ and transfer t should be such that the distribution of (Y^x,Z^x) coincides with the conditional distribution of men of type x whose choice is y and z under μ, that is

$$(Y^x,Z^x)\sim\mu\left(y,z|x\right):=\mu\left(x,y,z\right)/f\left(x\right).$$

Similarly, at equilibrium, the distribution of (X^y,Z^y) should coincide with the conditional distribution of women of type y whose choice is x and z under μ, that is

$$(X^y,Z^y)\sim\mu\left(x,z|y\right):=\mu\left(x,y,z\right)/g\left(y\right).$$

Definition 2. *An equilibrium outcome consists of a feasible matching $\mu\in\mathcal{M}(f,g)$ and a transfer $t\in\mathbb{R}$ so that $\mu(x,y,z)$ is both the mass density of men of type $x\in\mathcal{X}$*

such that $(y,z) \in \mathcal{Y}_0 \times \mathcal{Z}$ *is solution to*

$$\max_{(y,z)} \left\{ \alpha(x,y,z) + t(x,y,z) + \varepsilon(y,z) \right\}$$

and the mass density of women $y \in \mathcal{Y}$ *such that* $(x,z) \in \mathcal{X}_0 \times \mathcal{Z}$ *is solution to*

$$\max_{(x,z)} \left\{ \gamma(x,y,z) - t(x,y,z) + \eta(x,z) \right\}.$$

In our continuous logit setting, the density of the conditional distributions $\mu(y,z|x)$ and $\mu(x,z|y)$ are proportional to the exponential of the systematic part of the surplus, cf. online Appendix A. Hence, the conditional distribution of men of type x whose choice is y and z under μ reads as

$$\mu(y,z|x) = \frac{\exp\left(\alpha(x,y,z) + t(x,y,z)\right)}{\int_{\mathcal{Z}} \left(\exp \alpha(x,0,z') + \int_{\mathcal{Y}} \exp\left(\alpha(x,y',z') + t(x,y',z')\right) dy'\right) dz'}, \tag{2.3}$$

whereas the conditional distribution of women of type y whose choice is x and z under μ obtains as

$$\mu(x,z|y) = \frac{\exp\left(\gamma(x,y,z) - t(x,y,z)\right)}{\int_{\mathcal{Z}} \left(\exp \gamma(0,y,z') + \int_{\mathcal{X}} \exp\left(\gamma(x',y,z') - t(x',y,z')\right) dx'\right) dz'}. \tag{2.4}$$

We are now ready to present the following theorem characterizing an equilibrium outcome, whose proof appears in online Appendix B.

Theorem 1. *(i) Outcome* (μ, t) *is an equilibrium outcome if and only if:*

- μ *is a solution to the social planner's primal problem*

$$\mathcal{W}(\Phi) := \sup_{\mu \geq 0} \int_{\mathcal{Z}} \begin{pmatrix} \int_{\mathcal{XY}} \Phi(x,y,z)\mu(x,y,z)dxdy \\ + \int_{\mathcal{X}} \alpha(x,0,z)\mu(x,0,z)dx + \int_{\mathcal{Y}} \gamma(0,y,z)\mu(0,y,z)dy \end{pmatrix} dz - \mathcal{E}(\mu) \tag{2.5}$$

where if $\mu \in \mathcal{M}(f,g)$

$$\begin{aligned} \mathcal{E}(\mu) \; : \; &= \int_{\mathcal{Z}} \left(2 \int_{\mathcal{XY}} h\left(\mu(x,y,z)\right) dxdy + \int_{\mathcal{X}} h\left(\mu(x,0,z)\right) dx + \int_{\mathcal{Y}} h\left(\mu(0,y,z)\right) dy \right) dz \\ &- \left(\int_{\mathcal{X}} h\left(f(x)\right) dx + \int_{\mathcal{Y}} h\left(g(y)\right) dy \right) \end{aligned}$$

with $h(x) := x \log x$*, and else*

$$\mathcal{E}(\mu) \; : \; = +\infty$$

and

- *$t=(t\,(x,y,z))$ is a minimizer of the dual problem*

$$\inf_t \int_{\mathcal{X}} G_x(t)f(x)dx+\int_{\mathcal{Y}} H_y(t)g(y)dy, \tag{2.6}$$

where $G_x(t)$ (resp. $H_y(t)$) is the expected indirect utility of men of type x (resp. women of type y) and the infimum extends to all functions $(x,y,z)\to t\,(x,y,z)$ where the objective is defined.

(ii) The first order conditions yield

$$\log\frac{\mu\,(x,0,z)}{\mu\,(x,0,Z(x))}=\alpha(x,0,z) \text{ for } (x,z)\in\mathcal{XZ}, \tag{2.7}$$

$$\log\frac{\mu\,(0,y,z)}{\mu\,(0,y,Z(y))}=\gamma(0,y,z) \text{ for } (y,z)\in\mathcal{YZ}, \tag{2.8}$$

$$\log\frac{\mu\,(x,y,z)}{\mu\,(x,0,Z(x))}=\alpha(x,y,z)+t\,(x,y,z) \text{ for } (x,y,z)\in\mathcal{XYZ}, \tag{2.9}$$

$$\log\frac{\mu\,(x,y,z)}{\mu\,(0,y,Z(y))}=\gamma(x,y,z)-t\,(x,y,z) \text{ for } (x,y,z)\in\mathcal{XYZ}, \tag{2.10}$$

and hence

$$\log\frac{\mu^2\,(x,y,z)}{\mu\,(x,0,Z(x))\,\mu\,(0,y,Z(y))}=\Phi(x,y,z) \text{ for } (x,y,z)\in\mathcal{XYZ}, \tag{2.11}$$

for the primal problem and

$$\mu\,(y,z|x)\,f(x)=\mu\,(x,z|y)\,g(y), \tag{2.12}$$

for the dual problem, where $\mu\,(.,.|x)$ and $\mu\,(.,.|y)$ are given by (2.3) and (2.4).

(iii) At equilibrium, each man of type x is in a household (x,y,z) that maximizes his surplus $\alpha(x,y,z)+t(x,y,z)+\varepsilon(y,z)$. Similarly, each woman of type y is in a household (x,y,z) that maximizes her surplus $\gamma(x,y,z)-t(x,y,z)+\eta(x,z)$.

Theorem (1) motivates the following remarks.

Remark 1 (Entropic penalization)**.** *The unobserved heterogeneity on both sides of the market manifests itself by the entropic penalization $\mathcal{E}\,(\mu)$ in the social planner's problem. In the absence of unobserved heterogeneity, the social planner's problem would consists in pairing men and women and allocating them to locations so as to maximize the total observable surplus*

$$\int_{\mathcal{Z}}\left(\int_{\mathcal{XY}}\Phi(x,y,z)\mu(x,y,z)dxdy+\int_{\mathcal{X}}\alpha(x,0,z)\mu(x,0,z)dx+\int_{\mathcal{Y}}\gamma(0,y,z)\mu(0,y,z)dy\right)dz$$

subject to feasibility constraints $\mu \in \mathcal{M}(f, g)$. The presence of unobserved heterogeneity adds an entropic penalization to this objective function. There exists a trade-off between matching on observable types which maximizes the first term on the right hand side of Equation 2.5 and matching on unobservables which maximizes the entropic term and pulls the solution towards random matching. It follows that idiosyncratic shocks introduce randomness in the matching of men and women on observable types.

Remark 2 (Marginal constraints in primal problem)**.** *One may wonder why the marginal constraints $\mu \in \mathcal{M}(f, g)$ do not appear in* sup *of equation (2.5). This is because $\mathcal{E}(\mu) = +\infty$ as soon as any of these constraints are not met, so the penalization by $\mathcal{E}(\mu)$ automatically implies the marginal constraints. There is no need for accounting constraints in (2.5) as they are already taken care of by $\mathcal{E}(\mu)$.*

Remark 3 (Expected utilities)**.** *Using Eqs. (2.7-2.10), the expected indirect utility of a man of type $x \in \mathcal{X}$ and woman of type $y \in \mathcal{Y}$ obtain respectively as*

$$G_x(t) = -\log \frac{\mu(x, 0, Z(x))}{f(x)}, \tag{2.13}$$

$$H_y(t) = -\log \frac{\mu(0, y, Z(y))}{g(y)}. \tag{2.14}$$

Remark 4 (Meeting rates)**.** *The results derived in Theorem (1) depend on the assumption that the idiosyncratic tastes follow i.i.d. Gumbel random processes. In the parlance of Gumbel random processes (see online AppendixA) it implies in particular that an individual's acquaintances are randomly distributed across locations. In the case of China for instance, while matrimonial agencies certainly make it possible to search spouses across locations, it is likely that meeting rates are relatively lower between rural and urban individuals than between natives. One would then wrongly interpret lower conditional probabilities of rural individuals to marry urban spouses as merely reflecting lower marital surplus for mixed-couples, while in fact they (partly) reflect lower meeting rates. Recent work by Jaffe and Weber (2019) introduces explicitly differential meeting rates in discrete matching models a la Choo and Siow (2006). In online Appendix A, we extend these results to the continuous logit formalism. In particular, defining $0 < a_m \leq 1$ the meeting rate of a rural man with urban women, $0 < b_m \leq 1$ the meeting rate of an urban woman with rural men, $0 < a_w \leq 1$ the meeting rate of a rural woman with urban men and $0 < b_w \leq 1$ the meeting rate of an urban man with rural women, we show that Equations (2.9-2.11) still hold as long as one replaces $\alpha(x, y, z)$ by $\alpha(x, y, z) + \log(a_m)$ and $\gamma(x, y, z)$ by*

$\gamma(x,y,z)+\log(b_m)$ *for mixed-couples composed of a rural man and urban woman and* $\alpha(x,y,z)$ *by* $\alpha(x,y,z)+\log(a_w)$ *and* $\gamma(x,y,z)$ *by* $\gamma(x,y,z)+\log(b_w)$ *for mixed-couples composed of a rural woman and urban man.*

Remark 5 (Market clearing)**.** *The encompassing model presented above is a static model which implies the following two underlying assumptions:*

- *agents decide simultaneously whether to migrate and which marriage market to enter and,*
- *the local marriage markets have cleared.*

The mapping from conditional probabilities to utility in Equations (2.7-2.10) therefore fails to hold as soon as one of these two assumptions is violated. However, ample empirical evidence shows that migration and marriage decisions tend to occur both early in life and typically in one's 20s.[6] *This means that the encompassing model can be readily applied to individuals in their 30s or above, i.e. for which the marriage markets have cleared.*

2.2. **Identification.** We consider identification of the "work", "hedonic enjoyment" and "marrying-up" effects of migration using a single cross-section of data. The data is assumed to contain information about single men and women as well as couples, both natives and migrants, but no information about marital transfers. Recall that $Z(x)$ (resp. $Z(y)$) indicates the birthplace of a (wo-)man of type x (resp. y), whereas z denotes his (her) residence.

2.2.1. *Identification of the "work" and "hedonic enjoyment" effects of migration.* To identify the "work" and "hedonic enjoyment" effects of migration, the main objects of interest are the following:

- $\alpha(x,0,z)$, the migration surplus of a single man of type x living at location $z \neq Z(x)$,
- $\gamma(0,y,z)$, the migration surplus of a single woman of type y living at location $z \neq Z(y)$,
- $\Phi(x,y,z)$ - $\Phi(x,y,z')$, the joint migration surplus of a couple (x,y) so that $z' = Z(x) = Z(y)$ living at location z, $z \neq z'$.

[6]In the Chinese context, for instance, Bodvarsson et al. (2014) shows that the likelihood to migrate picks in one's twenties and You et al. (2016) shows that the age at first marriage is about 24 for women and single women older than 27 have very low probabilities to get married.

Using Equations (2.7), (2.8) and (2.11) in Theorem (1), one obtains immediate identification results for these objects:

(1) The mass of native single men of type x, $\mu(x,0,Z(x))$, and the mass of migrant single men of type x migrating from $Z(x)$ to location z, $\mu(x,0,z)$, identify the surplus of migration from $Z(x)$ to location z for single men of type x as

$$\alpha(x,0,z) = \log \frac{\mu(x,0,z)}{\mu(x,0,Z(x))}. \tag{2.15}$$

(2) The mass of native single women of type y, $\mu(0,y,Z(y))$, and the mass of migrant single women of type y migrating from $Z(y)$ to location z, $\mu(0,y,z)$, identify the surplus of migration from $Z(y)$ to location z for single women of type y as

$$\gamma(0,y,z) = \log \frac{\mu(0,y,z)}{\mu(0,y,Z(y))}. \tag{2.16}$$

(3) The mass of couples (x,y), born at location $Z(x) = Z(y) = z'$ and residing at location $z \neq z'$, together with the mass of couples (x,y), born at location $Z(x) = Z(y) = z'$ and residing at location z' identify the joint migration surplus of couples (x,y) at z as

$$\Phi(x,y,z) - \Phi(x,y,z') = 2 \log \frac{\mu(x,y,z)}{\mu(x,y,z')}. \tag{2.17}$$

We now proceed to the decomposition of the migration surplus into the "work" effect and the "hedonic enjoyment" effect. To this aim, we decompose the marital surplus of couples into three additive terms:

$$\Phi(x,y,z) \quad : \quad = \Phi^{wed}(x,y,z) + \alpha^{work}(x,y,z) + \gamma^{work}(x,y,z) \tag{2.18}$$

for all $(x,y) \in \mathcal{XY}_0$, and $(Z(x), Z(y), z) \in \mathcal{Z}^3$ and where $\Phi^{wed}(.,.,z)$ is the marriage hedonic enjoyment at location z and $\alpha^{work}(.,.,z)$ (resp. $\gamma^{work}(.,.,z)$) is the husband's (wife's) surplus from work at location z.

In our static model, by definition, the migration surplus of singles is merely related to differences in work opportunities or hedonic enjoyment (i.e. utility derived from public goods such as theaters, opera house etc.) across locations. However, as stated formally in the following assumption, for singles, the differences in hedonic enjoyment across locations are likely to be negligible compared to the differences in utility generated by differences in labor market opportunities across locations.

Assumption 1. *For singles, hedonic enjoyment differentials across locations are negligible compared to the utility differentials associated with variation in labor opportunities across locations, so that one has*

$$\begin{aligned}\alpha^{work}(x,0,z) &:= \alpha(x,0,z) \text{ for all } x \in \mathcal{X} \\ \gamma^{work}(0,y,z) &:= \gamma(0,y,z) \text{ for all } y \in \mathcal{Y}.\end{aligned}$$

We further assume there is no labor market discrimination against or in favor of married individuals as stated in the following assumption.

Assumption 2. *Labor market opportunities in each location are independent of one's marital status.*

Under Assumption (2), the "work" effect of migration for a married (wo)man x (resp. y) living at z equates that of a single (wo)man of type x (resp. y) and reflects relative labor market opportunities at destination. Formally, one therefore has

$$\begin{aligned}\alpha^{work}(x,y,z) &= \alpha^{work}(x,z) = \alpha(x,0,z), \\ \gamma^{work}(x,y,z) &= \gamma^{work}(y,z) = \gamma(0,y,z),\end{aligned}$$

for all $(x,y) \in \mathcal{X}\mathcal{Y}$, and $(Z(x), Z(y), z) \in \mathcal{Z}^3$.

It is important to note that Assumption (2) allows for married individuals and singles of similar attributes to take different labor market decisions, only their opportunities are required to be the same. For couples, labor market decisions are joint decisions that, under Assumption (2), are reflected in $\Phi^{wed}(.,.,z)$ the marriage hedonic enjoyment at location z.[7]

[7] For instance, an extensive literature (e.g. Korenman and Neumark, 1991 and for China, Wang, 2013) provides evidence that married (cohabiting) men earn higher wages than single men, due to, for instance, a decrease in housework time after marriage. Assumption (2) indicates that these marital wage-premia will be attributed to the "marriage hedonic enjoyment" effect for the husbands. Alternatively, an individual marrying a wealthy spouse may end up not working. In that case, this individual's work surplus as identified by Assumption (2) is negated in this individual's "marriage hedonic enjoyment" surplus.

It follows that under Assumptions (1-2), the "work" effect of migration for men and women are identified respectively as

$$\alpha^{work}(x,z) = \log \frac{\mu(x,0,z)}{\mu(x,0,Z(x))}, \tag{2.19}$$

$$\gamma^{work}(y,z) = \log \frac{\mu(0,y,z)}{\mu(0,y,Z(y))}, \tag{2.20}$$

whereas, for couples, the "marriage hedonic enjoyment" effect of migration is identified as

$$\Phi^{wed}(x,y,z) - \Phi^{wed}(x,y,z') = 2\log \frac{\mu(x,y,z)}{\mu(x,y,z')} - \log \frac{\mu(x,0,z)}{\mu(x,0,z')} - \log \frac{\mu(0,y,z)}{\mu(0,y,z')} \tag{2.21}$$

where $Z(x) = Z(y) = z' \neq z$.

Note that the "work" effect is identified at the individual level, whereas the "marriage hedonic enjoyment" effect is identified at the couple level since data on marital transfers are not observed. It follows that while the "work" effect can be identified for migrants in mixed-couples, the "marriage hedonic enjoyment" effect cannot. Nevertheless, our primary interest is in comparing the "work" effect of migration to the "marrying-up" effect, which both are identified at the individual level as we shall see in the following section.

2.2.2. *Identification of the "marrying-up" effect of migration.* Unlike the "work" and "marriage hedonic enjoyment" effects of migration that can be directly identified from the observed matching data, the "marrying-up" effect requires to compute the counter-factual equilibrium that would have occurred if migrants in mixed-couples would have entered their birthplace marriage market instead of the destination's one. To quantify the "marrying-up" effect of migration we therefore proceed as follows:

(1) First, we compute the equilibrium for the observed market, i.e. given the identified objects, i.e. $\alpha(x,0,z)$, $\gamma(0,y,z)$ and $\Phi(x,y,z)$.[8]
(2) Second, we compute the counterfactual equilibrium where preferences are as in the observed market, i.e. given the aforementioned identified objects, but assuming meeting rates between individuals from different birthplaces are 0 which, following Remark (4), is equivalent to setting $\Phi(x,y,z) = -\infty$ for $Z(x) \neq Z(y)$.

[8]Subsection 2.4 below shows how to compute an equilibrium given $\alpha(x,0,z)$, $\gamma(0,y,z)$ and $\Phi(x,y,z)$.

While the first equilibrium corresponds to the observed situation, the second equilibrium is so that mixed-couples never form which guarantees the absence of the "marrying-up" effect of migration. Comparing the expected indirect utility, i.e. computed using Eqs. (2.13-2.14), in the two equilibria quantifies the "marrying-up" effect of migration. Note that migration is still possible in the second equilibrium, individuals can either migrate as singles or as couple of migrants.

2.3. **Inference.** Following Choo and Siow (2006), a natural approach would be to estimate nonparametrically the marital and migration surpluses by discretizing the observed attributes x and y and using Eqs. (2.19), (2.20) and (2.21). The main issue with this approach is that many cells (x, y, z) are likely to have very few or even no observations at all. As an alternative, we follow Dupuy and Galichon (2014), and adopt a parametric approach. We specify the surplus function as linear in its parameters $\lambda \in \mathbb{R}^K$ so that

$$\Phi\left(x, y, z; \lambda\right) = \sum_{k=1}^{K} \lambda_k \varphi^k(x, y, z)$$

where $\left\{\varphi^k(x, y, z)\right\}_{k=1}^{K}$ are K linearly independent basis functions.

Under this parametric specification, the social welfare function can be rewritten as

$$\mathcal{W}(\lambda) := \sup_{\mu \geq 0} \int_{\mathcal{X}\mathcal{Y}\mathcal{Z}_0} \Phi\left(x, y, z; \lambda\right) \mu(x, y, z) dxdydz - \mathcal{E}\left(\mu\right). \tag{2.22}$$

where $\mathcal{E}\left(\mu\right)$ is as defined in Theorem (1).

Denoting $\mu^\lambda(x, y, z)$ the equilibrium matching given parameters λ, by the envelope theorem one has

$$\frac{\partial \mathcal{W}\left(\lambda\right)}{\partial \lambda_k} = \int_{\mathcal{X}\mathcal{Y}\mathcal{Z}_0} \varphi^k(x, y, z) \mu^\lambda(x, y, z) dxdydz. \tag{2.23}$$

This suggests using a matching moment estimator that is: find λ such that the moments generated by the model match with the moments observed in the data, i.e.

$$\int_{\mathcal{X}\mathcal{Y}\mathcal{Z}_0} \varphi^k(x, y, z) \mu^\lambda(x, y, z) dxdydz = \int_{\mathcal{X}\mathcal{Y}\mathcal{Z}_0} \varphi^k(x, y, z) \hat{\mu}(x, y, z) dxdydz \text{ for all } k = 1, ..., K \tag{2.24}$$

where $\hat{\mu}$ denotes the observed matching in the data.

This matching moment estimator, denoted λ^{MM}, is then obtained as the solution to the following problem

$$\min_{\lambda} \mathcal{W}(\lambda) - \int_{\mathcal{X}\mathcal{Y}\mathcal{Z}_0} \Phi\left(x,y,z;\lambda\right)\hat{\mu}(x,y,z)dxdydz, \tag{2.25}$$

since indeed, the first order conditions of this problem yield exactly Equation (2.24).

Note that $\mathcal{W}(.)$ is strictly convex in Φ and $\Phi\left(.,.,.;\lambda\right)$ is linear in λ such that the objective function in Problem (2.25) is strictly convex and hence admits a unique solution.

In our leading case, the surplus function is specified such that the parametrization satisfies Assumptions (1-2) and in particular

$$\begin{aligned}
\Phi\left(x,y,z;\lambda\right) &:= \Phi^{wed}\left(x,y,z;A\right) + \alpha^{work}\left(x,z;B\right) + \gamma^{work}\left(y,z;C\right), \quad (2.26)\\
\Phi^{wed}\left(x,y,z;A\right) &:= \sum_{k=1}^{K_A} A_k \varphi_A^k(x,y,z),\\
\alpha^{work}\left(x,z;B\right) &:= \sum_{k=1}^{K_B} B_k \varphi_B^k(x,z),\\
\gamma^{work}\left(y,z;C\right) &:= \sum_{k=1}^{K_C} C_k \varphi_C^k(y,z),
\end{aligned}$$

such that $\lambda = (A,B,C)$ where $A \in \mathbb{R}^{K_A}$, $B \in \mathbb{R}^{K_B}$ and $C \in \mathbb{R}^{K_C}$ and where each set $\left\{\varphi_A^k(x,y,z)\right\}_{k=1}^{K_A}$, $\left\{\varphi_B^k(x,z)\right\}_{k=1}^{K_B}$ and $\left\{\varphi_C^k(y,z)\right\}_{k=1}^{K_C}$ is composed respectively of K_A, K_B and K_C basis functions, which are jointly independent.

2.4. **Computation.** Our estimation strategy consists in finding the parameter λ such that the associated moments match the observed moments in the data. This strategy requires fast computation of the equilibrium matching. We propose to extend the procedure introduced in Galichon and Salanié (2015) to the context of the encompassing model in the following way. Consider that each individual in our sample defines its own type such that there is one and only one (wo-)man of each type. Given a sample of men and women, let $\mu_{ijz} = \mu(x_i, y_j, z)$ and $\Phi^{\lambda}_{ijz} = \Phi\left(x_i, y_j, z;\lambda\right)$ for $i \in \mathcal{I}$, $j \in \mathcal{J}$ and $z \in \mathcal{Z}$, $\mu_{i0z} = \mu(x_i, 0, z)$ and $\Phi^{\lambda}_{i0z} = \Phi\left(x_i, 0, z;\lambda\right)$ for $i \in \mathcal{I}$ and $z \in \mathcal{Z}$ and $\mu_{0jz} = \mu(0, y_j, z)$ and $\Phi^{\lambda}_{0jz} = \Phi\left(0, y_j, z;\lambda\right)$ for $j \in \mathcal{J}$ and $z \in \mathcal{Z}$, such that the (sample) feasibility constraints for any matching in our sample read as

$$\begin{aligned}\sum_{i\in\mathcal{I}}\sum_{z\in\mathcal{Z}}\mu_{ijz}+\sum_{z\in\mathcal{Z}}\mu_{0jz} &= 1,\\ \sum_{j\in\mathcal{J}}\sum_{z\in\mathcal{Z}}\mu_{ijz}+\sum_{z\in\mathcal{Z}}\mu_{i0z} &= 1.\end{aligned} \tag{2.27}$$

The equilibrium matching given values of λ is then computed by first noting that, from Theorem (1), in equilibrium one has

$$\mu_{ijz}=K_{ijz}\sqrt{\mu_{i0}\mu_{0j}},$$

$$\mu_{i0z}=L_{iz}\mu_{i0},$$

and

$$\mu_{0jz}=P_{jz}\mu_{0j},$$

where $\mu_{i0Z(x_i)}=\mu_{i0}$, and $\mu_{0jZ(y_j)}=\mu_{0j}$, and $K_{ijz}=\exp\left(\frac{\Phi^\lambda_{ijz}}{2}\right)$, $L_{iz}=\exp\left(\Phi^\lambda_{i0z}\right)$, and $P_{jz}=\exp\left(\Phi^\lambda_{0jz}\right)$.

The matching μ defined by these equilibrium relations should also satisfy the feasibility constraints in Equation (2.27), a condition that yields the following system of equations

$$\begin{cases}\sqrt{\mu_{i0}}\sum_{j\in\mathcal{J},z\in\mathcal{Z}}K_{ijz}\sqrt{\mu_{0j}}+\sum_{z\in\mathcal{Z}}L_{iz}\mu_{i0}=1\\ \sqrt{\mu_{0j}}\sum_{i\in\mathcal{I},z\in\mathcal{Z}}K_{ijz}\sqrt{\mu_{i0}}+\sum_{z\in\mathcal{Z}}P_{jz}\mu_{0j}=1\end{cases}.$$

A bit of algebra provides a solution for μ_{i0} as a function of the vector $\left(\mu_{0j}\right)$ and conversely, a solution for μ_{0j} as a function of the vector (μ_{i0}) that read as

$$\begin{cases}\mu_{i0}=\left(\sqrt{\frac{1}{\sum_{z\in\mathcal{Z}}L_{iz}}+\left(\frac{\sum_{j\in\mathcal{J},z\in\mathcal{Z}}K_{ijz}\sqrt{\mu_{0j}}}{2\sum_{z\in\mathcal{Z}}L_{iz}}\right)^2}-\frac{\sum_{j\in\mathcal{J},z\in\mathcal{Z}}K_{ijz}\sqrt{\mu_{0j}}}{2\sum_{z\in\mathcal{Z}}L_{iz}}\right)^2\\ \mu_{0j}=\left(\sqrt{\frac{1}{\sum_{z\in\mathcal{Z}}P_{jz}}+\left(\frac{\sum_{i\in\mathcal{I},z\in\mathcal{Z}}K_{ijz}\sqrt{\mu_{i0}}}{2\sum_{z\in\mathcal{Z}}P_{jz}}\right)^2}-\frac{\sum_{i\in\mathcal{I},z\in\mathcal{Z}}K_{ijz}\sqrt{\mu_{i0}}}{2\sum_{z\in\mathcal{Z}}P_{jz}}\right)^2\end{cases}. \tag{2.28}$$

The solution $\left(\mu^\lambda_{i0},\mu^\lambda_{0j}\right)$ for this problem can be attained by the following simple algorithm:

(1) take an initial guess of μ_{0j},
(2) update the values of μ_{i0} using the current values of μ_{0j} in the first formula of System (2.28),
(3) update the values of μ_{0j} using the current values of μ_{i0} in the second formula of System (2.28),

(4) go back to step 2 until convergence.

3. Empirical analysis

3.1. **Context.** This section provides a brief historical account of China's rural-to-urban migration; for a thorough account and a survey of the related literature, we refer the reader to Zhao (2005). Migration used to be free in China up until the Great Famine in the late 1950s, when the Chinese government implemented a permanent geographic registration of Chinese citizens, i.e. the "Hukou system", in an effort to control for rural-to-urban migration. One's Hukou ties an individual to either a rural or urban location, is determined by birth and inherited from one generation to the next. Up until the end of the 1980s, migration was extremely difficult: Changing one's Hukou was merely impossible and strict restrictions were imposed that inhibited rural households from migrating.[9] In particular, migration through marriage was very limited by the rule that a child's Hukou should be determined by the mother's Hukou.

In the last three decades, the booming economy led to a sharp increase in rural-to-urban migration. At the same time, China's policy on rural migration changed gradually allowing more people to change their Hukou status. As a result, the number of rural-to-urban migrants rose rapidly, doubling between 1989 and 1993 according to some estimates (Shi, 2008). Interestingly, the rule that a child's Hukou be determined by the mother's Hukou was abolished in 1998 leading to a significant increase in inter-hukou marriages (see Nie and Xing, 2012).

The Hukou system creates two types of rural-to-urban migrants. Rural migrants that succeed in changing their Hukou, the so-called *permanent migrants*, and those that do not, the *floating migrants*.[10] Changing one's hukou from rural to urban requires approval of the place of destination and is (still today) both very difficult, as very specific conditions need to be met such as holding a higher education diploma, a high military grade, or owning a house in urban area, and very important for assimilation, since it opens access to the same amenities and job market as urban people. As a result, while permanent migrants assimilate quite rapidly, floating migrants usually hold jobs in the informal sector, the so-called four "Ds": Dirt, Drain, Danger,

[9] For instance, the provision of food coupons in urban areas was strictly limited to urban residents (holding an urban Hukou) which made it very difficult for rural people to have access to food in urban areas.

[10] See Liang and Ma (2004) for a discussion of the differences between the two groups of migrants.

and Disgrace, and have only limited access to urban public goods such as health care (insurance) and education.

The analysis of rural-to-urban migration in China requires taking into account this dual migration situation. In particular, the current rules and regulations in most cities in China are such that a rural born individual must decide whether or not to migrate before knowing whether he/she will be granted a change of Hukou as indicated by the US Congressional-Executive Commission on China (2017):

> Migrants must still meet locally-set criteria in order to transfer their Hukou registration to a given urban area. Generally, these reforms require that rural migrants have 1) a "stable job or source of income" and 2) lived in a "stable place of residence" for over two years as conditions for obtaining local Hukou in urban areas.

Rural born individuals need therefore to form expectations about their probability of being granted an urban Hukou when deciding whether to migrate or not.

3.2. **Data.** Our aim is to construct a cross-sectional representative sample of couples and singles, both natives and migrants, for whom the marriage market has cleared. To this aim, we use the 2008 wave of the Rural Urban Migration in China (RUMiC) longitudinal dataset. This dataset consists of three surveys ran in China, i.e. the Urban Household Survey (UHS), the Rural Household Survey (RHS), and the Migrant Household Survey (MHS), collected since 2008. The RHS and UHS have been conducted in collaboration with the National Bureau of Statistics of China (NBS), while the MHS has been conducted in partnership between a professional survey company on the one hand and scholars around the world and in particular from the Australian National University and IZA on the other hand.[11]

[11] The RUMiC data are readily available from the International Data Service Center (IDSC) of IZA and we refer the interested reader to Akgüç et. al (2014) for a detailed description of the data. Note, however, that the main advantage of the RUMiC data compared to other existing households surveys in China lies in its sampling procedure for floating migrants. While the RHS and UHS are subsamples drawn from the national household survey of the NBS, the MHS survey was conducted separately, drawing migrant households at their work place rather than their place of residence to account for the fact that many floating migrants live in dormitories adjacent to their workplace and usually have no registered address. For more details about the sampling procedure see the RUMiCI Project's homepage, http://rse.anu.edu.au/research-projects/rural-urban-migration-in-china-and-indonesia/, or Kong (2010).

The RHS comprises $8,000$ households, while the UHS and MHS each cover $5,000$ households. Using these data, we define urban (resp. rural) natives as those individuals interviewed in the UHS (resp. RHS) file who possess a urban (resp. rural) Hukou and report not having changed their Hukou. Following Akgüç et. al (2014), we then define a rural-to-urban floating migrant as an individual who has a rural Hukou but lives and is surveyed in the city at the time of the survey (either from the MHS or the UHS files). We further define a rural-to-urban permanent migrant as an individual who lives and is surveyed in the city at the time of the interview but reports a change of Hukou from rural to urban (again either from the MHS or the UHS files).[12]

The RHS was conducted in 9 provinces: Anhui, Chongqing, Guangdong, Hebei, Henan, Hubei, Jiangsu, Sichuan, and Zhejiang. The MHS was conducted in 15 cities, either provincial capitals or cities with the largest floating migrants inflow: Bengbu, Chengdu, Chongqing, Dongguan, Guangzhou, Hefei, Hangzhou, Luoyang, Nanjing, Ningbo, Shanghai, Shenzen, Wuhan, Wuxi, Zhengzhou. The UHS was conducted in 19 cities: the 15 cities listed above but also Anyang, Jiande, Leshan and Mianyang. UHS households living in one of the 4 cities not listed in the MHS are excluded from the analysis.

Our methodology must be applied on a representative sample of households for the provinces and cities covered in the three samples. Although the MHS, RHS and UHS surveys are representative of the respective targeted populations, their relative size does not match with the actual relative proportions of these populations. Following Song and Yue (2011), we account for this issue by constructing weights for

[12]Note that less than 17% of the floating migrants in our selected sample (aged between 29 and 39 years old for men and 27 and 37 years old for women in 2009) report having been back to their home village for longer than 3 months after migrating to the city. The floating migrants herewith identified are long term migrants in line with the requirement of our analysis. Note also that according to this definition, individuals interviewed in the RHS file but reporting having been away from home for more than 3 months in the last 12 months are treated as non-migrants. These individuals are likely to repeat short-term migration spells whereas our analysis focusses on long-term migrants. Finally, note that in our selected sample about 60 individuals reporting a change of Hukou, i.e. 10% of permanent migrants, mention “land expropriation” as the reason. While expropriated individuals did not actually migrate, Akgüç, Lui and Tani (2014) show they have better labor market outcomes and their children have better educational outcomes than rural natives (or floating migrants). In the main analysis, we therefore treat them as permanent migrants. However, as a robustness check, we also performed the analysis on a sample excluding these individuals. Results do not differ significantly from those presented below.

the respective populations using the 2005 mini census. In the 2005 1% mini census of households, there were about 982, 000 rural households in the 9 provinces covered by the RHS survey and, about 832, 000 urban households (including permanent migrants) and 121, 000 floating migrant households in the 15 cities covered by the MHS (and restricted UHS). This implies that a representative sample of households for the provinces and cities of interest should contain 50.7% of rural households, 43.0% of urban and permanent migrant households and 6.3% of floating migrant households. Using the UHS sample size as the benchmark, i.e. about 4, 700 households, the size of our representative sample should therefore be about 11, 000 households; 5, 500 rural, 700 floating migrant and 4, 700 urban and permanent migrant households. We therefore randomly select 5, 500 rural households from the RHS files and 700 floating migrant households from the MHS files.[13]

Following Remark 5, the encompassing model applies to agents for which the local marriage markets have cleared, i.e. individuals for which the probability of getting married in the future conditional on being single at the time of the interview is virtually zero. In China, unmarried individuals older than 27 are called "Sheng Nu" (leftover) precisely because the probability of getting married passed that age is very low (see for instance You et al., 2016). We make use of this feature of the Chinese marriage market and select, for our analysis, women older than 27. Following the literature (see e.g. Chiappori et al., 2017), we select men older than 29 to reflect the fact that, in China, as in many countries, husbands tend to be on average 2 years older than their wives.

Finally, noting that rural-to-urban migration really took up at the beginning of the 1990s (Shi, 2008) following major migration policy reforms at the end of the 1980s, we only keep in our sample individuals that were too young to legally get married before 1990. We do so by further restricting our sample to women younger than 37 (i.e. younger than 19 years old in 1990) and men younger than 39.

3.3. **Couples and singles.** In the RHS and UHS surveys all adult persons in the household were interviewed whereas in the MHS, only those adult persons currently living with the respondent at the urban location were interviewed. Each respondent was asked about his/her marital status and could choose out of 6 categories. We

[13]We estimate the parameters of the model using one randomly drawn sample but produce bootstrapped standard errors using 200 stratified samples with replacement, where the files RHS, MHS and USH identify the strata.

use the answer to that question and consider herewith as "single" all respondents that reported being the head of the household and being either divorced, widowed or never married/single. The remaining respondents, i.e. those who either reported being married, remarried or cohabiting, are considered as being "in couple".

Our dataset of couples is then constructed as follows. For each of the three surveys, we split the sample containing respondents being "in couple" and create two datasets, one containing women and one containing men. We then merge the men dataset to the women dataset using the household identifier. We use the respondents' reported relationship to the head of their household and keep only the "correct" matches: head of household with spouse of the head, parent of the head with parent-in-law of the head, and biological child of the head with child-in-law of the head. We discard all other matches.

Table (1) reports the number of couples, single women and single men in our working data, distinguishing between rural and urban natives and, floating and permanent migrants,[14] both for men and women. Note that our data contains 91 mixed-couples. There are 59 mixed-couples composed of a migrant wife (15 floating and 44 permanent) and an urban native husband and 32 composed of a migrant husband (3 floating and 29 permanent) and an urban native wife. We use these couples to quantify the "marrying-up" effect.

3.4. **Selected Variables.** Our main measure of education is self-reported years of schooling. Note, however, that the data also contains information about the highest level of education completed.[15] We use this latter measure of education in addition to years of schooling when predicting the probability that a rural born individual would obtain an urban Hukou upon migrating as university education is a known key determinant.

[14]There is no information about when and where couples married in the data. It is therefore impossible to distinguish between migrants couple that met before migrating and migrant couples that met at destination. In our empirical exercise, we therefore assume that all migrant couples are of the former type. Note however that the "marriage hedonic enjoyment" is the same in both cases since it captures the additional utility derived from enjoying life together at current location (urban) which is the same for both types of migrant couples.

[15]The UHS and RHS surveys use a 9 categorical scale to classify individuals whereas the MHS survey uses a 28 categorical scale. Nevertheless, the two scales have a similar decomposition into 5 standard educational levels: (1) primary education, (2) junior secondary education, (3) senior and specialized secondary education, (4) polytechnic college and (5) university education.

The data also contains information about body weight and height which enables us to calculate each individual's Body Mass Index (BMI), i.e. the individual's body mass in kg divided by the square of its height in meters.

The respondents were also asked to report their general health. The phrasing of the question was: "What is your current health status (compared to people your age)" and were presented with 5 alternatives, from (1) Excellent to (5) Very poor. Using answers to this question we created a health variable by subtracting the answer to the question to 5.

Our working dataset consists of those households with complete information on age, height, BMI, health and years of schooling. Table (2) reports descriptive statistics by groups (rural, urban and types of migrants, floating or permanent) and gender. The anticipated results are noticeable: rural men (women) have lower years of schooling than urban men (resp. women), permanent migrants have more years of schooling than floating migrants which merely reflects the fact that having a University degree is one condition to obtain an urban Hukou and, permanent migrants are older than floating migrants which could reflect that fact that on average permanent migrants studied longer and that it takes time to be granted an urban Hukou.

4. Results

4.1. **Parametric specification.** The context of internal migration in China, highlighted in Section 3.1, and the data at our disposal impose several modelling restrictions. First, note that as indicated in Equations (2.19), (2.20) and (2.21), the identification of the "work" and "marriage hedonic enjoyment" surplus of migration relies on the mass of single migrants. As indicated in Table (1), there are between 15 and 20 single migrants of each type, i.e. floating and permanent, and gender. As a result, there are not enough observations to identify the migration surplus across cities. We therefore aggregate destinations into a single destination, i.e. urban, hence distinguishing two locations, namely rural and urban and set $\mathcal{Z} = \{0, 1\}$, where $z = 1$ for urban locations by convention. Second, the bulk of internal migration in China is rural-to-urban migration; there is virtually no urban-to-rural migration in our data. In the logit model that we are using, the only utility that is compatible with the absence of urban-to-rural migration is

$$\alpha^{work}(x, z; B) = \gamma^{work}(y, z; C) = -\infty \text{ if } Z(x) = Z(y) = 1 - z = 1.$$

Third, given parameter λ, the algorithm presented in Section 2.4 computes the associated equilibrium matching. The equilibrium matching indicates for instance whether an individual migrates or not. In China, individuals do not know whether the government will grant them a change of Hukou before they move to the city. Rural born individuals must therefore decide whether to migrate or not based on their probability of obtaining an urban Hukou and becoming a permanent migrant. For each rural born man of type x (resp. woman of type y), denote $W(x) \in [0,1]$ (resp. $W(y) \in [0,1]$) the probability that he (she) would obtain an urban Hukou and hence become a permanent migrant. To calibrate the probabilities $W(x)$ (resp. $W(y)$) we use the marginal predicted probabilities of a probit model with sample selection a la Van de Ven and Van Praag (1981) applied on the sample of rural born men (resp. women). The dependent variable is a dummy taking for value 0 for floating migrants, 1 for permanent migrants, and missing for non-migrants. The explanatory variables in both the selection and probit equations are the variables of interest (years of schooling, age, height, BMI and health) and a dummy for university education since this is an official criterion for obtaining an urban Hukou (see Section 3.1).[16]

Fourth, Section 3.1 provides evidence suggesting that permanent migrants assimilate relatively quickly in cities unlike floating migrants, who face limited access to urban amenities and are often only eligible for the jobs in the informal sector. We therefore choose the following modelling strategy:

(1) different vectors of parameters to model the systematic surplus from work of the respective types of migrants: B^P and C^P for permanent migrant men and women respectively and, B^F and C^F for floating migrant men and women respectively, and
(2) different vectors of parameters to model the "marriage hedonic enjoyment" of rural native couples, A^R and urban native couples, A^U, and assuming that floating migrant couples share the same "marriage hedonic enjoyment" parameters as rural natives, i.e. A^R, whereas permanent migrant couples assimilate and share the same "marriage hedonic enjoyment" as urban couples, i.e. A^U.

[16]As is well-known, the absence of an exclusion restriction in the selection equation implies the model is identified through functional assumptions (Gaussian errors) and the parameters have no structural interpretation. Nevertheless, as anticipated from the discussion in Section 3.1, education and age have positive and significant coefficients in the probit equation reflecting the fact that obtaining an urban Hukou is difficult and can take several years and education is an important criteria. Detailed results are available from the author upon request.

In particular we choose the following parametric specification for both the "marriage hedonic enjoyment" and the "work" surplus. For the former we use absolute difference basis functions[17] and, let $A = (A_0, A_1, A_2, A_3)$ and $A_i = \left(A_i^U, A_i^R\right)$ for $i = 1, 2, 3$ and $A_0 = \left(A_0^R, A_0^U, A_0^{M_m}, A_0^{M_w}\right)$.[18] We distinguish between 5 types of couples:

(1) Rural native couples $Z(x) = Z(y) = z = 0$ for which

$$\Phi^{wed}(x, y, z; A) = \sum_{k,l} A_{1(k,l)}^R \left|\tilde{x}^{(k)} - \tilde{y}^{(l)}\right| + A_2^R \tilde{x} + A_3^R \tilde{y} + 2A_0^R,$$

(2) Urban native couples $Z(x) = Z(y) = z = 1$ for which

$$\Phi^{wed}(x, y, z; A) = \sum_{k,l} A_{1(k,l)}^U \left|\tilde{x}^{(k)} - \tilde{y}^{(l)}\right| + A_2^U \tilde{x} + A_3^U \tilde{y} + 2A_0^U,$$

(3) Mixed-couples whose husband is a migrant $1 - Z(x) = Z(y) = z = 1$ for which

$$\Phi^{wed}(x, y, z; A) = \sum_{k,l} A_{1(k,l)}^U \left|\tilde{x}^{(k)} - \tilde{y}^{(l)}\right| + A_2^U \tilde{x} + A_3^U \tilde{y} + A_0^U + A_0^{M_m},$$

(4) Mixed-couples whose wife is a migrant $Z(x) = 1 - Z(y) = z = 1$ for which

$$\Phi^{wed}(x, y, z; A) = \sum_{k,l} A_{1(k,l)}^U \left|\tilde{x}^{(k)} - \tilde{y}^{(l)}\right| + A_2^U \tilde{x} + A_3^U \tilde{y} + A_0^U + A_0^{M_w},$$

(5) Migrant couples $1 - Z(x) = 1 - Z(y) = z = 1$ for which

$$\begin{aligned}
\Phi^{wed}(x, y, z; A) = \; & (1 - W(x))(1 - W(y)) \sum_{k,l} A_{1(k,l)}^R \left|\tilde{x}^{(k)} - \tilde{y}^{(l)}\right| \\
& + [1 - (1 - W(x))(1 - W(y))] \sum_{k,l} A_{1(k,l)}^U \left|\tilde{x}^{(k)} - \tilde{y}^{(l)}\right| \\
& + \left[W(x) A_2^U + (1 - W(x)) A_2^R\right] \tilde{x} + \left[W(y) A_3^U + (1 - W(y)) A_3^R\right] \tilde{y} \\
& + \left[W(x) A_0^U + (1 - W(x)) A_0^R\right] + \left[W(y) A_0^U + (1 - W(y)) A_0^R\right].
\end{aligned}$$

[17] We choose the absolute difference specification rather than the bilinear specification of Dupuy and Galichon (2014) as in our case it provides lower values of the objective function in Equation (2.25).

[18] Note that the constant for husbands and wives are set equal to each other by convention as the moment estimator only identifies one constant per couple. Indeed, for each type of couples, the associated moment condition equates the observed mass of couples to the one predicted given parameters.

The matrices A_1^i for $i = \{R, U\}$, indicate the "marriage hedonic enjoyment" resulting from the difference in spouses' attributes. Note that the matrix A_1^U applies not only to urban couples, but also to mixed-couples, couples consisting of a floating spouse and a permanent spouse and permanent migrant couples since we assume these couples assimilate as quickly. The vectors A_2^i and A_3^i for $i = \{R, U\}$, indicate the "marriage hedonic enjoyment" associated with the attributes of husbands and wives respectively. The constant terms A_0^i for $i = \{R, U\}$ indicate "marriage hedonic enjoyment" at mean values of spouses' attributes for each type of couples and the associated moment conditions pin down the mass of couples of each type. Likewise, the constants $A_0^{M_w}$ and $A_0^{M_m}$, whose moment conditions pin down the mass of mixed-couples, could reflect mixed-couples specific "marriage hedonic enjoyment." However, following Remark (4), these parameters could also (partly) reflect less than unity meeting rates between rural and urban individuals.[19]

The systematic surplus from work for men and women are modelled respectively as

$$\begin{aligned} \alpha^{work}(x, z; B) &= \left[B^P W(x) + B^F (1 - W(x))\right] \begin{pmatrix} \tilde{x} \\ 1 \end{pmatrix} \text{ if } Z(x) = 1 - z = 0 \\ &= 0 \text{ else,} \end{aligned} \tag{4.1}$$

where $B = \left(B^F, B^P\right)$, and

$$\begin{aligned} \gamma^{work}(y, z; C) &= \left[C^P W(y) + C^F (1 - W(y))\right] \begin{pmatrix} \tilde{y} \\ 1 \end{pmatrix} \text{ if } Z(y) = 1 - z = 0 \\ &= 0 \text{ else,} \end{aligned} \tag{4.2}$$

where $C = \left(C^F, C^P\right)$.

The model is therefore fully parameterized by the vector

$$\lambda = (A, B, C).$$

4.2. **Estimates.** We estimate the vector of parameters λ using the Matching Moment estimator introduced in Section 2.3. We use height, health, years of schooling, BMI and age as the observable attributes for men and women such that λ contains 98

[19] In particular, in the absence of "marriage hedonic enjoyment" differences between mixed-couples and urban couples, $A_0^{M_w} - A_0^U$ should be equal to 0 unless meeting rates between rural and urban individuals are lower than unity. In this case, one would have that $A_0^{M_m} - A_0^U = \log(a_m) + \log(b_m)$ and $A_0^{M_w} - A_0^U = \log(a_w) + \log(b_w)$.

parameters.[20] Note that, without loss of generality, these attributes are standardized. This accomplishes 3 things. First, it facilitates the comparison of the magnitude of the parameters, which are now expressed in standard deviation units for the corresponding attribute. Second, since in our sample, on average husbands are two years older than their wives, the absolute difference specification introduced in the previous sections allows us to naturally capture the fact that the marital surplus is maximal when the husband is two years older than his wive, i.e. when the absolute difference in standardized age is 0. Third, since standardized attributes are measured in the same units, we can also include the absolute differences across attributes, i.e. say the age of one spouse and the BMI of the other. These off-diagonal terms capture the effects of differences in the relative position of each spouse in the distribution of the associated attribute. Finally, note also that all coefficients discussed below are statistically significant at 1% unless stated otherwise.

Parameters of the marriage surplus of rural-floating couples and urban-permanent couples are presented in two tables. Tables (3) presents the estimates of the matrices A_1^U and A_1^R. Each entry (k,l) of these matrices indicates the relative weight of the absolute difference between the k^{th} (row) attribute of the husband and the l^{th} (column) attribute of the wife in generating the marriage hedonic surplus of the associated type of couples. Table (4) presents the estimates $(A_0^i, A_2^i, A_3^i)_{i=U,R}$ of the marriage surplus related to the direct effects of observable attributes of each spouse for rural-floating and urban-permanent men and women respectively.

Inspection of Table (3) reveals several important results. First, all coefficients on the diagonal of the matrices A_1^i, $i = \{R, U\}$ are negative and significant, clearly indicating that like attracts like on all five attributes. Second, we find that the difference in spouses' years of schooling is the most important (negative) contributor to the marriage surplus for all types of couples distinguished.[21] However, our third result is that differences in spouses' health and age are nearly as important as differences in spouses' years of schooling. Fourth, some coefficients off-diagonal are significantly

[20]Each of the 2 affinity matrices A_1^i contains 5×5 parameters, vectors A_2^i and A_3^i for $i = U, R$ contain 5 parameters each, whereas vectors B^F, B^P, C^F and C^P contain $5+1$ parameters each and A_0^i for $i = U, R, M_w, M_m$ contain 1 parameter each.

[21]Note that since the encompassing model takes education has given, the estimates for years of schooling should therefore be interpreted with care. They may indeed very well capture the effects of other unobserved variables that correlate with years of schooling and affect the marital and migration decisions.

different from 0. This is the case, for instance, for the height of men (women) and the health of women (men) indicating that relatively taller spouses generate more surplus with relatively less healthy spouses (expect for the health of the husband and height of the wife in rural couples).

Inspection of Table (4) reveals three additional results. Holding the differences in spouses' attributes constant, we first note that the marriage surplus increases with the years of schooling of husbands, more so if the husband is a floating migrant, but decreases with the years of schooling of wives. Second, for all types of couples, the marriage surplus increases with the BMI of both spouses.[22] Third, the marriage surplus increases with the age of spouses except for rural native and floating migrant men.

Table (5) presents the estimates $\left(B^F, C^F\right)$ and $\left(B^P, C^P\right)$ related to the systematic surplus from work by gender and types of migrants.[23]. Not surprisingly, the surplus from work of permanent migrant men and women increases with years of schooling, although only the coefficient for women is significant at the 10% level. Estimates further indicate that the surplus from work is mainly related to the height of individuals: it increases with height for floating (not significant) and permanent (sig at 5%) migrant men and floating (sig at 5%) migrant women but decreases with the height of permanent migrant women (sig at 5%). Finally, results show that the surplus from work significantly (at 10%) decreases with age for floating migrant men.

4.3. **Migration in China: to work or to wed?** The remaining exercise consists in quantifying the contribution of the "work" and "marrying-up" effects of migration.

The "work" effect is simply computed using the estimates $\left(B^F, C^F\right)$ and $\left(B^P, C^P\right)$ in Equations (4.1) and (4.2) for men and women respectively. Note that by definition this effect is 0 for native urban men and women.

To quantify the "marrying-up" effect, we compute the expected indirect utility of men and women under two alternative values of the parameter λ, each representing

[22]Note that the BMI variable might not necessarily have a linear effect, i.e. too high a BMI might have detrimental effects on the marital and work surplus. However, including BMI^2 in the model, the coefficients are not significantly different from 0 except in the marital surplus for rural-floating husbands but with the wrong sign (positive).

[23]Note that these parameters are identified by, and estimated with, single migrants. Hence, the relatively small number of observations for single migrants in the data is reflected in the relatively large standard errors.

a different state of the world. Using the parameter estimates of the previous section, i.e. $\hat{\lambda}$, we compute the expected indirect utility of each man and woman in the current state of the world. This corresponds to the situation as observed in China in 2009, characterized by the presence of mixed-couples. Using $\tilde{\lambda} = \hat{\lambda}$ but with $\Phi^{\tilde{\lambda}}_{ij1} = -\infty$ for all (i, j) with $Z(x_i) = 1 - Z(y_j)$, we compute the expected indirect utility of each man and woman in the absence of the "marrying-up" effect by excluding the option of entering a destination's marriage market and forming a "mixed-couple".[24]

For each value $\lambda \in \left\{\hat{\lambda}, \tilde{\lambda}\right\}$, the expected indirect utilities of each man and woman are computed as follows. First, we use the algorithm presented in Section (2.4) to compute μ^{λ} the equilibrium matching associated with parameter λ. Second, plugging μ^{λ} into the empirical counterparts of Eqs. (2.13) and (2.14), we obtain the expected indirect utility of each man and woman as

$$\begin{aligned} G_i(\lambda) &= -\log \mu^{\lambda}_{i0}, \\ H_j(\lambda) &= -\log \mu^{\lambda}_{0j}, \end{aligned}$$

where we recall that $\mu^{\lambda}_{i0} = \mu^{\lambda}_{i0Z(x_i)}$ and $\mu^{\lambda}_{0j} = \mu^{\lambda}_{0jZ(y_j)}$.

It follows that,

$$\begin{gathered} G_i(\hat{\lambda}) - G_i(\tilde{\lambda}), \\ H_j(\hat{\lambda}) - H_j(\tilde{\lambda}), \end{gathered}$$

quantify the contribution of the "marrying-up" effect of migration in the welfare of each man i and each woman j.

Although the effects are computed for each man and each woman in the data, Tables (6-7) present the average "work" and "marrying-up" effects of migration by gender and types of households.[25] Columns 3 and 5 report the absolute effects whereas

[24]This is equivalent to setting the meeting rates between rural and urban individuals equal to 0.

[25]Each observation in our data corresponds to an individual that is observed being either an urban native individual married with a permanent migrant UP, married with a floating migrant UF, married with an urban native spouse UU, or an urban native single $U0$ or, a permanent migrant married with an urban native spouse PU, married with a permanent migrant PP, married with a floating migrant PF or single $P0$, or, a floating migrant married with an urban native spouse FU, married with a permanent migrant FP, married with floating migrant FF, or single $F0$ or, a rural native individual married with a rural native spouse RR or single $R0$. Note that by convention, the labelling of each type of household is so that the first character indicates the agent's own type, i.e. either urban native U, permanent migrant P, floating migrant F, or rural native R, and the

columns 4 and 6 report these effects expressed in percentages of the expected indirect utility computed for $\hat{\lambda}$.

We first note that the "work" effect of permanent migrants is systematically larger than that of floating migrants, a finding that (partly) reflects the better opportunities of the former in the urban labor market. We also find that the "work" effect of migrant men is larger than that of women regardless of the types of migrants considered. This finding is in line with empirical studies documenting a large (and rising) gender pay gap in China (Chi and Li, 2013 for instance). The magnitude of the "work" effect varies from 0.23 (7% of the expected indirect utility) for floating single men to 3.45 (53%) for permanent migrant men in mixed-couples. For women, it varies from 0.28 (8%) for single floating migrant women to 1.04 (24%) for permanent migrant women in mixed-couples.

Tables (6-7) also indicate that the "marrying-up" effect of migration is negative for all rural-born men, and positive for all urban-born men, the reverse being true for women. The magnitude of these effects is largest for urban native men, ranging from 0.23 (13%) for singles to 0.32 (13%) for those in mixed-couples, compared to magnitudes ranging from -0.06 (-1%) to -0.10 (-3%) for rural-born men. For women the magnitude of these effects varies between 0.19 (5%) and 0.22 (5%) for rural-born woman and -0.08 (-5%) and -0.13 (-6%) for urban native women.

These findings are consistent with a situation where the observed migrant women in mixed-couples are of types in relative short supply in the urban marriage market. This provides relatively large incentives (i.e. to marry-up) for these women to enter the urban marriage market instead of the rural marriage market. As a consequence, the supply of (these types of) women decreases in the rural marriage market. This worsens the position of (some types of) men on the rural marriage market, providing some (types of) men, i.e. the observed migrant men in mixed-couples, the incentives to enter the urban marriage market.

Interestingly, the "marrying-up" effect is also sizeable for other migrants than those in mixed-couples. These effects are explained by the fact that, when mixed-couples

second character indicates the spouse's type, including 0 to indicate singlehood. Denote T_i (T_j) the type of household formed by a man i (resp. woman j), and

$$\mathcal{T} = \{UP, UF, UU, U0, PU, PP, PF, P0, FU, FP, FF, F0, RR, R0\},$$

the set of possible types of households. We can therefore compute the average "work" and "marrying-up" effects of migration by type of household and gender.

cannot form, individuals observed in mixed-couples enter the rural marriage market instead. Since migrant women in mixed-couples are relatively more numerous than migrant men in mixed-couples, competition in the rural marriage market increases relatively more on the women side, leading to a lower (higher) of utility for all women (men).

Similarly, the “marrying-up” effect is felt by urban natives whether or not in mixed-couples. As anticipated from the aforementioned results, the “marrying-up” effect for urban native women (men) is negative (positive), their welfare decreasing (increasing) when rural native women (men) observed in mixed-couples enter the urban marriage market.

To conclude, while the “marrying-up” effect of migrant women in mixed-couples is 3.5 (floating) to 5 (permanent) times smaller than the “work” effect of migration, as these women enter the urban marriage market, they generate equilibrium “marrying-up” effects for all men and women which can be large relative to the “work” effect of migration for some types of migrants. For instance, for floating migrant women married with a permanent migrant men the “marrying-up” effect is only 1.5 times smaller than the “work” effect of migration and for floating migrant women married with a floating migrant men both effects are about as large.

5. Summary and Discussion

This paper contributes to the literature on two counts. First, this paper presents a marriage matching model encompassing the classical matching model a la Becker (1973) and Shapley and Shubik (1971) with the hedonic model a la Rosen (1974). As in the classical matching model, the marriage market is viewed as a matching market where men and women sort according to their attributes. Unlike the classical matching model, in the unified model there are several locations each with its own marriage market and labor market. The hedonic attribute in this model is the location where individuals decide to live at. Individuals can choose to stay at their current location and enter both the local marriage market and labor market. Alternatively, individuals can enter the local marriage market at their birthplace and then migrate as a couple to enter the destination’s local labor market. Finally, individuals can enter both the destination’s local marriage market and labor market. Migration induces additional costs but may also generate benefits in the form of better perspectives on the destination’s local markets. We draw insights from Choo and Siow (2006), Galichon and Salanié (2015) and Dupuy and Galichon (2014) in order to introduce unobserved heterogeneity in the model. We show that a stable equilibrium is equivalent to a Walrasian equilibrium and is Pareto optimal. We also provide identification results for the migration surplus of singles and couples.

Our second contribution is empirical. We apply our methodology on China's marriage market using data from the Rural Urban Migration in China (RUMiC) longitudinal dataset. In particular we study the extent to which individuals migrate to work or to wed.

We estimate the structural parameters of the model using an extension to the unified model of the matching moment estimator applied in Dupuy and Galichon (2014). Our estimates indicate that like attracts like on all five attributes used in the analysis: years of schooling, height, BMI, subjective health and age; while the similarity in spouses' years of schooling is the most important factor in generating joint marital surplus, health and age are almost as important. We also find that the marital surplus i) increases with the years of schooling of husbands, more so if the husband is a floating migrant, but decreases with the years of schooling of wives, ii) increases with the BMI of both spouses and iii) increases with the age of spouses except for rural native and floating migrant men. Finally, we find that the migration surplus of single men and women is mainly driven by the height of individuals, positively so for permanent migrant men and floating migrant women and negatively so for permanent migrant women.

We then use these estimates to quantify the "marrying-up"and "work" effects of migration, by comparing the observed equilibrium with a counterfactual equilibrium where ceteris paribus, rural and urban natives never meet and hence mixed-couples never form. Results show that the "marrying-up" effect is positive for floating (resp. permanent) migrant women in mixed-couples but 3.5 (resp. 5) times smaller than the "work" effect. Interestingly, as migrant women in mixed-couples enter the urban marriage market, they generate equilibrium "marrying-up" effects for all men and women by changing the relative supply of women both on the rural and urban marriage markets. These effects can be large relative to the "work" effect of migration for some types of migrants. For instance, for floating migrant women married with a permanent migrant man the "marrying-up" effect is only 1.5 times smaller than the "work" effect of migration and for floating migrant women married with a floating migrant man both effects are about as large. For urban native men, these effects represent roughly 13% of their expected indirect utility.

The encompassing model also has potential applications well outside family economics and the marriage market. The model developed in this paper, indeed, could easily be applied to other differentiated market such as the labor market, goods and services markets etc. While the hedonic approach has been favored in applications related to product differentiation, the growing importance of "fair trade" indicates that buyers actually care not only about the attributes of the product but also about the attributes of the seller. In labor economics, the encompassing model is also needed when workers' and firms' attributes can reflect both productivity and tastes, and sorting is driven by two simultaneous forces: compensating wage differentials and productive complementarities.

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