Pacs et mariages en France : une analyse économique

Marion Leturcq

École des Hautes Études en Sciences Sociales

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Marion Leturcq

Directeur de thèse : **M. Pierre-Yves Geoffard**

Jury :

Rapporteurs :	**Didier Blanchet**, INSEE
	Olivier Donni, Université de Cergy-Pontoise
Examinateurs :	**Luc Arrondel**, CNRS-PSE
	Bruno Crépon, CREST
	Pierre-Yves Geoffard, PSE
	Anne Solaz, INED

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CHAPITRE 1

Introduction générale

1 Le mariage : une institution en mouvement

1.1 Une demande pour le mariage ?

Qualifié de "mariage du siècle" par la presse, le mariage de Kate et William a touché un large public dans le monde, y compris en France : quelques 9 millions de téléspectateurs ont pu vivre en direct à l'échange des consentements, sur l'une des trois chaînes hertziennes couvrant l'événement. S'ils en doutaient encore, 1,3 millions de téléspectateurs ont également pu constater que les deux protagonistes s'étaient finalement dit "oui", grâce au résumé diffusé le soir même sur l'une des chaînes de la TNT. Si les fastes et la tradition ne sont pas étrangers à l'engouement du public français, le mariage princier a suscité une grande curiosité, voire un brin de fascination traduisant l'intérêt que le public français porte encore au mariage et à son rituel.

Un mois et demi plus tard, le législateur est appelé à se prononcer quant à la possi-

bilité d'ouvrir le mariage aux couples homosexuels en France [1]. La demande d'ouverture du mariage aux couples homosexuels traduit le fait que l'institution du mariage et sa symbolique revêt une certaine importance auprès de ces couples. Néanmoins, les partisans de l'ouverture du mariage aux couples de même sexe s'appuie sur la symbolique engendré par la différence de traitement entre les différents couples. La différence de traitement basée sur l'orientation sexuelle du couple est considérée comme une discrimination par les défenseurs du mariage gay, car elle crée une inégalité de droits entre différents couples : l'association SOS Homophobie voit dans l'ouverture du mariage aux couples homosexuels une étape primordiale à la lutte contre l'homophobie [2]. Au contraire, les détracteurs du mariage gay indiquent que la différence de traitement n'est pas discriminatoire car elle s'appuie sur l'idée que le mariage est l'élément constitutif de la famille, elle-même composée d'un homme et d'une femme, et éventuellement d'enfants [3].

Mariage princier, mariage homosexuel : ces deux événements ont marqué l'actualité du premier semestre 2011 en France. Ils ont en commun de rappeler une certaine symbolique du mariage : si le mariage princier évoque les contes de fées dans lesquels les protagonistes "se marièrent et eurent beaucoup d'enfants", le mariage gay va à l'encontre de celle-ci, en posant la question de la définition et de la signification du mariage aujourd'hui.

1. Proposition de loi visant à ouvrir le mariage aux couples de même sexe, discussion publique les 9 et 14 juin 2011, rejetée en 1ère lecture par l'Assemblée Nationale le 14 juin 2011

2. M^{e} Caroline Mécary, représentant l'Association SOS Homophobie et l'Association des parents et futurs parents gays et lesbiens le 18 janvier 2011 devant le Conseil Constitutionnel saisi pour une question prioritaire de constitutionalité n. 2010-92 : "SOS Homophobie a la conviction que la lutte contre l'homophobie passe aussi par la fin des discriminations légales qui existent à l'égard des lesbiennes et des gays en matière de mariage civil. C'est assez simple : si l'Etat ne permet pas le mariage civil aux couples homosexuels, il accrédite d'une certaine manière, dans l'inconscient collectif, l'idée que les homosexuels sont inférieurs. Ils sont inférieurs : ils n'ont pas les mêmes droits, ils ont moins de droits. Et ainsi, implicitement, sans le vouloir, l'Etat autorise, j'ai envie de dire entre guillemets, voire participe à la discrimination. Lutter pour l'égalité passe, aussi, par la fin des inégalités juridiques."

3. Rapport remis par le groupe de travail "FAMILLE", animé par les députés Anne Grommerch et Hervé Mariton. Juillet 2011 (Grommerch and Mariton, 2011)

1.2 Une institution aux contours mouvants.

Le mariage : marqueur d'une nouvelle entité juridique et économique.

En France, le mariage est inscrit dans le Code Civil : le législateur fixe un certain nombre de règles, qui décrivent les droits et devoirs des partenaires l'un envers l'autre, et par rapport à la société. Il ne propose pas de définition explicite et celle-ci découle de l'interprétation des textes de loi. Une définition du mariage, proposée par le gouvernement [4] fait référence à ces règles :

> *"Le mariage est un acte public, juridique et solennel par lequel un homme et une femme s'engagent l'un envers l'autre dans la durée, devant et envers la société, pour fonder ensemble un foyer. En se mariant, les époux font ensemble une double démarche.*
>
> *Ils acceptent et reconnaissent l'institution du mariage et la loi commune qui la régit, mais en retour, ils demandent à la société de reconnaître l'existence et la valeur de leur engagement mutuel et de leur assurer la protection de la loi. Le mariage civil, qui n'est pas une simple formalité administrative, ne commence et ne s'achève pas le jour de la cérémonie."*

Cette définition traduit l'importance du cadre législatif qui d'une part définit ce qu'est le mariage ("acte public, juridique et solennel"), à qui l'institution s'adresse ("un homme et une femme"), l'objectif du mariage ("pour fonder un foyer") et d'autre part offre le cadre législatif à la réalisation de cet objectif, en fixant les règles régissant les rapports interpersonnels des conjoints et envers les tiers.

La notion de foyer est donc au fondement même de l'institution du mariage, car elle définit ce sur quoi le couple, en se mariant, contracte. Or, celle-ci n'est ni atemporelle, ni universelle. Elle se trouve être la pierre d'achoppement de la question politique du ma-

4. Disponible à l'adresse : www.mariage.gouv.fr

riage gay. Les anti-mariage gay voient dans le mariage la fondation d'une famille [5]. Les pro-mariage gay voit dans le mariage le cadre législatif permettant de fonder "quelque chose" [6] de stable. La valorisation du mariage comme institution assurant la stabilité du couple est également revendiquée par les opposants au mariage gay [7]. Si les deux camps se rejoignent sur l'idée que le mariage traduit la stabilité du couple, les anti-mariage gay exposent la différence des sexes comme une condition constituant la nature même du mariage et les pro-mariage gay insistent sur le fait que le mariage naît de la volonté de deux personnes de vivre et de construire leur vie ensemble.

En opposant deux définitions du mariage, les débats concernant le mariage gay rappellent que, malgré ses racines millénaires, le mariage n'est pas une institution figée et ses contours sont mouvants. La définition de l'institution du mariage peut être amenée à évoluer, suite à des modifications de la loi, mais cette définition même traduit la nature du contrat. Ainsi, le cadre législatif n'a jamais cessé d'être modifié, pour prendre en compte les évolutions de la société.

Les principales évolutions du mariage au cours de la seconde moitié du 20^{e} siècle ont profondément modifié les relations familiales en déconnectant progressivement la famille du mariage. Depuis 1972, il n'est plus possible de distinguer un enfant (en particulier en termes d'héritage) selon le statut matrimonial des parents, en différenciant les enfants légitimes des enfants naturels. De plus, l'autorité paternelle a disparu au profit de l'autorité parentale, mettant les deux conjoints sur un pied d'égalité. Par ailleurs,

5. La définition du mariage est rappelée par la décision du TGI de Bordeaux du 27 juillet 2004, annulant le mariage entre deux personnes du même sexe prononcé à Bègles par Noël Mamère : "Cette justification [à la différence de traitement fondée sur l'orientation sexuelle] se trouve en l'espèce dans la fonction traditionnelle du mariage, communément considéré comme constituant la fondation d'une famille ;"

6. M^{e} Emmanuel Ludot représentant les requérantes le 18 janvier 2011 devant le Conseil Constitutionnel saisi pour une question prioritaire de constitutionalité n. 2010-92 : « Nous avons aujourd'hui deux femmes qui viennent vous dire "Nous voulons de cette stabilité, nous voulons participer à ce pilier qu'est le mariage [car c'est toujours un pilier], nous voulons nous engager l'une envers l'autre, [et dans l'engagement il y a toujours, ce qu'on oublie souvent, le devoir de secours,] se secourir quand ça va mal et nous voulons faire en sorte que nous puissions construire quelque chose" »

7. Rapport cité, remis par le groupe de travail "FAMILLE"

depuis 2001, les enfants adultérins ne peuvent plus être distincts des enfants légitimes. Ainsi, le statut matrimonial des parents ne permet plus de traiter distinctement les enfants. Ce changement répond à l'accroissement du nombre d'enfants nés hors-mariage et donc au développement de la cohabitation. Celle-ci traduit la déconnexion de la notion de couple de celle de mariage : la cohabitation est aujourd'hui un mode de vie courant, qu'il soit l'antichambre du mariage ou qu'il s'inscrive dans le long terme. Le mariage n'est plus l'acte fondateur du couple.

La cohabitation, également qualifiée d'union libre ou concubinage, est décrite depuis 1999 par l'Article 515-8 du Code Civil :

> *"Le concubinage est une union de fait, caractérisée par une vie commune présentant un caractère de stabilité et de continuité, entre deux personnes, de sexe différent ou de même sexe, qui vivent en couple."*

Union de fait, elle n'est que constatée par la loi, elle n'ouvre aucun droits ou devoirs aux partenaires l'un envers l'autre. Les concubins sont autonomes financièrement et la loi ne leur apporte quasiment aucune protection, en tant que couple. Les droits ouverts aux couples cohabitants peuvent être plus étendus dans certains pays d'Europe, rendant les comparaisons internationales difficiles (Gassen and Perelli-Harris, 2011).

Ainsi, le mariage permet aux partenaires de passer d'un cadre qui ne reconnaît pas leur union à un cadre législatif lui apportant une existence officielle. Le mariage constitue la mise en place d'une nouvelle entité juridique, qui peut être symbolisée par un nom de famille commun [8]. Cette nouvelle entité est également un acteur économique, puisque le mariage définit une communauté entre les époux qui mettent en commun leur patrimoine et leur ressources [9], et sont solidaires des dettes. La communauté étant

8. L'épouse a la possibilité de prendre le nom de son mari en tant que nom d'usage.

9. Ce qui entre dans la communauté du mariage dépend du contrat de mariage. Le régime matrimonial par défaut est celui de la communauté de biens réduite aux acquêts, qui stipule que seuls les biens acquis dans le mariage appartiennent à la communauté, à l'exception des donations et héritages. Les époux peuvent néanmoins opter pour le régime de séparation de biens : ils restent alors propriétaires des biens acquis même après le ménage ou pour la communauté universelle : l'ensemble

une entité économique et juridique, le divorce est également un acte juridique dont le but est de dissoudre la communauté.

Le mariage était la seule façon de rendre le couple officiel et de créer une entité juridique et économique jusqu'en 1999. Depuis, la création du pacs a offert aux couples hétérosexuels une forme alternative de reconnaissance officielle du couple.

La création d'une union alternative : le pacs

En parallèle du développement de la cohabitation hors mariage, l'offre de contrats matrimoniaux s'est diversifiée avec la création du Pacte Civil de Solidarité (pacs) [10] en France le 15 Novembre 1999. Le pacs est défini par l'article 515-1 du Code Civil :

> *"Un pacte civil de solidarité est un contrat conclu par deux personnes physiques majeures, de sexe différent ou de même sexe, pour organiser leur vie commune."*

Le pacs est né de la revendication des couples homosexuels à voir leur union reconnue légalement et à bénéficier d'un cadre protecteur pour leur couple. Sa création a été l'objet de nombreux débats dont la question centrale était la reconnaissance légale des couples de même sexe. Il est toutefois intéressant de remarquer que la première proposition de loi visant à créer une forme d'union alternative, portée devant le Sénat en 1990, incluait la possibilité d'ouvrir cette union à tous types de duos, y compris fratries et couples hétérosexuels. Cette possibilité a été conservée dans toutes les propositions qui ont suivi : CUC (Contrat d'Union Civile, 1991-1995), CVS (Contrat de Vie Sociale, 1995), CUS (Contrat d'Union Sociale, 1995), PIC (Pacte d'Intérêt Commun,

des biens est alors intégrée à la communauté.

10. Le Pacte Civil de Solidarité est désigné dès sa création par son acronyme PaCS. Néanmoins, le terme "pacs" est aujourd'hui largement utilisé, si bien qu'il tend à devenir un nom à part entière. Il est récemment entré dans le dictionnaire *Le Larousse*. Le mot "pacs" a donné naissance au verbe "se pacser" et à ses dérivatifs.

1995) puis PACS (Pacte Civil de Solidarité, 1998-1999)[11]. Ainsi, dès les premiers débats concernant la mise en place d'une union alternative, la France se distingue de ses prédécesseurs européens : le Danemark (1989), la Norvège (1993) et la Suède (1995) mettent en place des unions exclusivement destinées aux couples homosexuels. Seuls les Pays-Bas (1998) et la Belgique (2000) proposent des unions ouvertes à tous les couples. Il s'agissait donc de créer une union distincte du mariage, pensée également pour apporter une solution aux couples qui ne désirent pas se marier.

Contrairement au mariage, le pacs est un contrat d'ordre privé, signé par les deux partenaires au tribunal d'instance dont dépend leur lieu de résidence. Son objet premier est de faciliter l'organisation matérielle de la vie des couples. Il partage donc un certain nombre de caractéristiques avec le mariage : prévu pour l'organisation de la vie commune, il instaure un devoir d'aide mutuelle et d'assistance et il offre une structure juridique permettant la mise en commun des ressources et du patrimoine du ménage. Le pacs est plus facile à dissoudre qu'un mariage, une simple lettre notifiant la dissolution du pacs au tribunal d'instance suffit. La décision de dissoudre la pacs peut être prise conjointement par les partenaires ou unilatéralement par un des partenaires. Il est également automatiquement dissous suite au mariage ou au décès d'un moins l'un des partenaires. Moins engageant qu'un mariage, il ne partage pas tous les bénéfices associés au mariage, n'ouvrant par exemple ni le droit à l'adoption, ni la possibilité de bénéficier de la pension de réversion en cas de décès du partenaire. Il propose néanmoins un contrat facilitant un certain nombre d'aspects matériels de la vie du couple, en terme de protection (transfert de bail), de transmission et d'organisation.

La loi définissant le pacs a néanmoins été modifiée à différentes reprises. En 2004, les dispositions relatives à l'enregistrement et l'utilisation de données concernant les

11. La version finale du texte exclue les fratries et la jurisprudence a jugé que le terme de "vie commune" introduisait dans le texte une notion de vie de couple, qui ne couvre pas seulement une communauté d'intérêt et ne se limite pas à une simple cohabitation entre les individus (Code Civil, Dalloz, édition 2007)

couples pacsés facilitent l'accès à l'information sur les couples pacsés[12]. La loi de finance 2005 annonce que l'imposition des couples pacsés est alignée sur celle des couples mariés. La loi du 23 juin 2006 modifie les droits et devoirs des partenaires pacsés, renforçant les devoirs d'assistance et d'aide mutuelle. En 2007, la fiscalité portant sur les transmissions entre partenaires pacsés ou mariés est allégée et rendue similaire pour les deux types de couples. Depuis 2007 également, le pacs est mentionné en marge de l'Etat Civil : il est donc devenu information publique.

Ainsi, les textes encadrant la reconnaissance officielle des couples ont beaucoup évolué au cours des dernières décennies. Durant la période, le recours au mariage (et au pacs) a également été bouleversé : alors que le nombre de mariages contractés chaque année a fortement baissé, le nombre de pacs n'a pas cessé d'augmenter.

1.3 Le mariage : une institution rétrograde ?

Le mariage peut aujourd'hui être perçu comme une institution rétrograde en France : en 1999, 36% des personnes interrogées dans le *World Value Survey* déclarent penser que le mariage est une institution dépassée et la presse peut relayer ce message, comme l'illustre le dessin humoristique page 9.

Près de 250,000 mariages ont été célébrés en France en 2009 : la mariage n'a pas disparu du paysage français, toutefois son usage a été profondément bouleversé au cours des dernières décennies. Près de 300,000 mariages étaient prononcés chaque année dans les années 1950, le nombre est monté à 400,000 au début des années 1970 et n'a quasiment pas cessé de baisser depuis. Le taux brut de mariage[13] est passé de 7,8 en 1970 à 3,9 en 2009. Il est pour autant difficile d'en déduire directement une désaffectation du mariage car les taux sont affectés par le changement de structure

12. Ce point est détaillé par la suite.
13. Nombre de mariage pour 1000 habitants

FIGURE 1 – Les Indégivrables, 21 juin 2011

par âge de la population et le recul de l'âge au mariage [14].

En parallèle, le nombre de divorces prononcés a augmenté chaque année jusqu'en 2005 : autour de 30,000 divorces sont prononcés chaque année dans les années 1950 alors que près de 130,000 divorces sont prononcés en 2009. Les taux de divorce pour 1000 mariages ont augmenté chaque année, quelque soit la durée du mariage [15]. L'augmentation du nombre de divorce modifie également le profil de la population mariée : si les premiers mariages représentent encore la majorité des mariages, les remariages sont plus fréquents aujourd'hui. En 1970, pour 92,5% des mariages, l'épouse célèbre son premier mariage (90% pour les hommes). En 2009, cette proportion s'élève à 80,8% (79,3% pour les hommes).

Le profil type du/de la jeune marié(e) qui se marie pour la première fois, est aisé à établir en 1970 mais il l'est moins en 2009. En 1970, le jeune marié a en moyenne 24,4 ans. S'il ne les a pas exactement, il y a de fortes chances pour que son âge soit proche de l'âge moyen : 72% des nouveaux mariés ont entre 20 et 25 ans [16]. En 2009, le jeune marié a en moyenne 32,8 ans, mais il risque de ne pas appartenir à la catégorie d'âge la plus représentée : seulement 41% des jeunes mariés ont entre 27 et 32 ans. En 1970, la jeune mariée a quant à elle, en moyenne 22,4 ans l'année de son mariage, et 73% des jeunes mariées ont entre 18 et 23 ans. En 2009, elle a 30,7 ans et seules 44% ont entre 25 et 30 ans l'année de leur mariage, bien que cette catégorie d'âge soit la plus représentée [17].

Corrolaire de l'augmentation de l'âge moyen au premier mariage, la cohabitation précédant le mariage s'est également généralisée : près de 20% des unions ont commencé par une période de cohabitation en 1970, cette proportion est de 90% en 1996

14. Le chapitre 2 de cette thèse présente des éléments de réponse à la question de la désaffectation du mariage.

15. Toutes les chiffres présentés ici sont rendus disponibles par l'INSEE.

16. Les catégories d'âge sont constitués des 6 années au cours desquelles on observe le plus de mariages.

17. Tous les chiffres présentés dans ce paragraphe sont issus de calcul directement effectués sur les bases d'Etat Civil.

(Toulemon, 1996)[18]. En 1970, seuls 4,4% des époux ont déjà eu au moins un enfant avant de se marier, quand il s'agit d'un premier mariage pour les deux. En 2005, ils sont 32% dans ce cas[19].

Ainsi, le profil classique du/de la jeune marié(e) a changé en quelques décennies et s'est dilué : le premier mariage recouvre aujourd'hui des situations plus hétérogènes qu'en 1970. Ces récentes évolutions de l'usage du mariage sont souvent interprétées comme une désaffectation des couples à l'égard du mariage. Elles traduisent principalement le fait que le mariage n'est plus l'unique cadre permettant de penser la conjugalité : l'union libre et le pacs depuis 1999 proposent des alternatives au mariage.

Si les unions libres sont difficiles à observer, il est possible de rendre compte de l'évolution du nombre de pacs. Près de 20000 pacs ont été contractés au cours de ses premières années d'existence (2000-2001) et ce nombre n'a cessé d'augmenter depuis, pour atteindre les 200,000 couples pacsés en 2010. Le nombre de pacs contractés est aujourd'hui proche du nombre de mariages enregistrés chaque année, lui conférant parfois une image d'union à la mode, en témoigne le dessin humoristique page 12.

Le portrait des couples pacsés est difficile à tirer, car peu de données micro sont disponibles. En effet, au moment de la création du pacs, le législateur a pensé nécessaire de protéger les couples pacsés en conservant l'information de leur statut de pacsés sur un fichier protégé. Le pacs était par ailleurs considéré comme un contrat privé, il n'était donc pas obligatoire de le mentionner et les enquêtes publiques (auxquelles la réponse est obligatoire) avaient pour interdiction d'interroger la personne sur son statut de pacsé. Il en a résulté un déficit de données sur les partenaires pacsés pendant quelques années. Le caractère secret et protégé de l'information a été levé en 2004, mais la prise en compte du statut de pacsé n'a pas été immédiatement mis en place dans les enquêtes publiques. Les premières données micro sur les couples pacsés

18. Ces chiffres restent cependant difficilement interprétables dans la mesure où il s'agit de mesure portant sur le stock de couples, mêlant ainsi différentes générations.

19. Il n'est plus possible de distinguer les couples ayant déjà eu des enfants avant leur mariage depuis 2006, dans les données de l'Etat Civil.

FIGURE 2 – Les Indégivrables, 9 février 2011

devraient être disponibles courant 2011. Ainsi, les informations dont nous disposons sur les couples pacsés sont éparses et concernent peu de couples : elles proviennent d'entretiens qualitatifs, d'enquêtes privées, ou du rapprochement des fichiers fiscaux avec des données d'enquête, à l'exception des quelques renseignements micro apportés par le Ministère de la Justice qui concernent l'ensemble des couples pacsés, mais dont l'accès est très restreint. Les seules données accessibles du grand public sont le nombre de pacs contractés par tribunal d'instance et par trimestre depuis sa création.

Le Ministère de la Justice indique que les couples pacsés hétérosexuels sont un peu plus âgés que les couples mariés, et que la probabilité de dissolution d'un pacs est plus forte pendant les premières années mais similaire à partir de 3 ans (Carrasco, 2007). Les entretiens menés par Wilfried Rault (2009) décrit des couples dont les motivations pour se pacser sont différentes d'un couple à l'autre : certains voient dans le pacs un contrat facilitant leur vie matérielle, d'autres y accordent une véritable symbolique pour la construction de leur couple. Les rapprochements des données fiscales et de l'enquête emploi dépeint des couples sans enfants, de milieu social aisé (Davie, 2011).

Le paysage matrimonial français est singulier. La France est un des seuls pays au monde à avoir créé un contrat de couple alternatif au mariage, ouvert aux couples homosexuels et hétérosexuels, car la plupart des pays à avoir pensé un contrat alternatif l'ont restreint aux couples homosexuels. Seuls les Pays-Bas, la Belgique et le Luxembourg ont proposé ce contrat à tous types de couples. Il est donc difficile d'offrir des comparaisons internationales portant sur un large panel de pays, qui permettrait de comprendre si les couples hétérosexuels réagissent de façon similaire à la mise en place d'une union alternative. Néanmoins, la comparaison de la France, de la Belgique et des Pays-Bas en fig.1.3 permet de constater que le recours à une forme alternative d'union n'est pas similaire d'un pays à l'autre.

Si le recours au pacs est plus important en France qu'aux Pays-Bas, il l'est moins

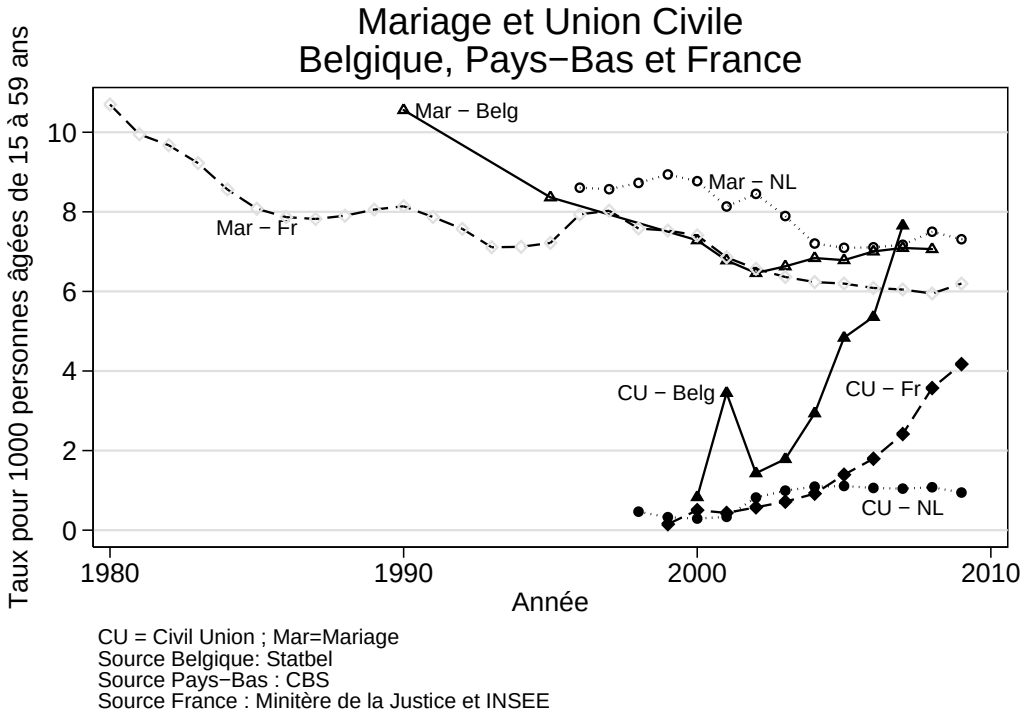


FIGURE 1.3: Taux de mariage et d'union civile en Belgique, Pays-Bas et France

qu'en Belgique. Le taux de mariage est le plus élevé aux Pays-Bas et le plus faible en France. Néanmoins, les contrats de partenariats civils sont différents d'un pays à l'autre : le contrat de partenariat enregistré néerlandais (*Geregistreerd partnerschap*) est très proche du mariage, alors que le contrat belge (Cohabitation légale / *Wettelijke samenwoning*) est plus distinct du mariage et est ouvert à tous types de duos, y compris les fratries ou toutes personnes vivant ensembles. Il est alors moins engageant que le pacs français.

Ainsi, il est important d'étudier l'évolution du choix de se marier/se pacser en lien avec le cadre institutionnel qui régit la famille et le couple. En distinguant les couples mariés des couples non mariés, le cadre juridique est ambivalent : il guide les choix des individus en valorisant un certain mode de vie mais son évolution indique qu'il

entérine également les évolutions du comportement des couples. Il est donc important de comprendre comment le cadre institutionnel interagit avec le comportement des individus. Ces questions sont au centre des débats politiques actuels, notamment en matière de fiscalité. En proposant la suppression du quotient conjugal, qui impose une taxation commune des couples, Landais, Piketty, and Saez (2011) [20] indiquent que ce type d'imposition valorise un mode de vie des couples, à savoir les couples monoactifs, qui n'est plus en phase avec la réalité des couples contemporains. En réponse à leur proposition, plusieurs rapports concernant l'évolution de la famille ont vu le jour, soit pour promouvoir une sauvegarde du modèle familial traditionel [21], soit pour faire évoluer le cadre juridique actuel [22].

2 Problématique et plan de la thèse

2.1 Problématique générale

Le mariage en tant que contrat a été peu étudié en économie. Les travaux précurseurs de Becker (1973; 1974; 1981) proposent une théorie du couple et du matching plutôt qu'une théorie du mariage [23]. Le cadre légal importe peu : les individus choisissent la situation de couple (sous entendu : "d'être marié") par rapport à la situation d'être seul (sous-entendu : "d'être célibataire"). Couple et mariage n'ont pas été distingués car peu de couples vivaient en union libre au moment de la rédaction du *Traité*

20. Les questions soulevées par ce livre dépassent largement la question de la fiscalité des couples, qui est prise comme un exemple des débats contemporains sur le mariage et ses effets.

21. Rapport remis par le groupe de travail "FAMILLE", animé par les députés Anne Grommerch et Hervé Mariton. Juillet 2011 (Grommerch and Mariton, 2011)

22. Pôle "Affaires sociales" de Terra Nova et Guillaume Macher, "Politique familiale : d'une stratégie de réparation à une stratégie d'investissement social" Projet 2012, Contribution n.9 (Macher, 2011)

23. Gary Becker, "The economic way of looking at life", Nobel Lecture, 9 Decembre 1992 : "The point of departure of my work on the family is the assumption that when men and women decide to marry or have children or divorce, they attempt to maximize their utility by comparing benefits and costs. So they marry when they expect to be better off than if they remained single, and they divorce if that is expected to increase their welfare."

de la famille. Néanmoins, le développement de la cohabitation hors mariage a conduit de nombreuses disciplines à s'intéresser au mariage, tant d'un point de vue théorique (droit, droit comparé) que d'un point de vue empirique (sociologie, anthropologie, démographie). Les travaux économiques ont beaucoup étudié les choix familiaux (offre de travail, fécondité) et la façon dont ces choix sont élaborés au niveau du ménage (modèle de ménage unitaire, modèle de ménage collectif) sans distinguer le cadre légal dans lequel les membres du couple interagissent[24]. Cela traduit implicitement une adhésion à l'idée que le théorème de Coase est vérifié dans le cadre familial. Celui-ci peut être énoncé de la façon suivante[25] : "the allocation of property rights or legal liability does not influence resource allocation when the parties involved can bargain with each other at little cost." En effet, si les conjoints peuvent négocier à moindre coût (information symétrique, utilité transférable et coûts de transaction faibles), les choix adoptés par le couple seront alors efficaces, indépendamment du statut légal du couple. Cependant, celui-ci revêt une certaine importance dès lors que le ménage n'est pas perçu comme une unité une et indivisible : si les membres du couple sont amenés à négocier sur l'allocation des ressources du ménage (temps de travail, patrimoine) le point de menace, défini comme la meilleure option alternative qui s'offre à chaque membre du couple si la négociation n'aboutit pas, est un élément clé pour comprendre la négociation. En imposant une certaine répartition des biens produits dans le mariage par les membres du couple qui dépend du type de contrat de mariage, le cadre législatif impose une répartition des titres de propriété sur les ressources du ménage, qui peut affecter le point de menace et donc le pouvoir de négociation de chacun des deux conjoints. En redistribuant les droits de propriété entre les deux membres du couple, le mariage permet de transférer de l'utilité d'un conjoint à l'autre, sans forcément modifier la production du ménage. Ainsi, même si le théorème de Coase est vérifié, le cadre

24. Les modèles de ménage collectif peuvent prendre en compte les caractéristiques du cadre légal, car ils prennent explicitement en compte le pouvoir de négociation au sein du ménage.

25. Définition apportée par Betsey Stevenson et Justin Wolfers dans Stevenson and Wolfers (2007)

légal peut modifier le bien-être des membres du couple.

Si le théorème de Coase est vérifié, les taux de divorce et de mariage ne devraient pas être altérés en cas de modification du cadre légal. En effet, Becker, Landes, and Michael (1977) indiquent que la possibilité de divorcer de manière unilatérale ne devrait pas modifier le taux de divorce, car le divorce unilatéral permet de redistribuer les titres de propriété, à savoir la propriété sur sa propre volonté de divorcer dont chaque conjoint dispose. Or, les études empiriques ne semblent pas corroborer ce point (Friedberg, 1998; Wolfers, 2006). Ainsi, le choix de divorcer et, de la même façon, le choix de se marier pourrait être affecté par le cadre législatif du mariage.

Par conséquent, le cadre législatif ne modifie pas seulement la répartition des ressources au sein du ménage, mais il peut aussi influencer les choix du ménage, dès lors que les conjoints ne peuvent pas nécessairement négocier à moindre coût. Les coûts de négociation proviennent du fait que le couple est composé de deux entités différentes, qui sont alors sujettes à des problèmes économiques classiques inhérents à toute négociation : information imparfaite, crédibilité de l'engagement, etc.

Par ailleurs, le développement de la cohabitation hors mariage a mis en valeur le fait que le mariage relève aujourd'hui d'un double choix : le choix de se marier n'est pas automatique et, si le couple choisit de se marier, le moment auquel il se marie n'est pas dicté par une norme sociale. Matouschek and Rasul (2008) proposent d'expliquer le choix de se marier en examinant trois modèles de mariage basé sur l'idée que les conjoints sont deux entités différentes : le premier modèle suggère que le mariage apporte un bénéfice exogène aux conjoints, le second modèle considère le mariage comme un moyen de s'engager durablement pour les conjoints dans un contexte de jeux répétés, le troisième propose de considérer le mariage comme un moyen de signaler à l'autre conjoint sa volonté de rester ensemble, dans un contexte d'information imparfaite. Ces théories voient dans le mariage un cadre définissant les relations inter-

personnelles des conjoints. La théorie du mariage comme signal est également proposée par Bishop (1984), qui voit dans le mariage la possibilité d'indiquer au reste du monde son engagement dans une relation stable. Elle permet alors de voir dans le mariage un cadre social, pouvant jouer un rôle dans l'intégration du couple à son environnement économique et social. Ces différents modèles permettent d'apporter des éléments de réponse expliquant pourquoi les couples décident de se marier, sans pour autant expliquer le moment auquel les couples décident de se marier. Ces théories du mariage s'appuient sur l'idée que le mariage se distingue de l'union libre selon une dimension : le coût de séparation. Or, en imposant droits et devoirs aux conjoints et en proposant une reconnaissance sociale du couple, la différence entre le mariage et l'union libre, de même que la différence entre pacs, mariage et union libre est multidimensionnelle, le choix peut donc être guidé par différents éléments.

Sans proposer une théorie du mariage, l'objet de cette thèse est d'apporter des éléments à la réflexion portant sur le choix de se marier, en intégrant notamment la richesse du cadre matrimonial français car la mise en place d'une forme alternative d'union crée de la variation au niveau de l'offre de contrat. L'idée inhérente à la thèse est de tester la neutralité économique du mariage et du pacs, traitée selon deux angles différents. Dans un premier temps, la question repose sur l'impact de critères économiques sur le choix d'officialiser son union. Dans un second temps, l'intérêt est porté sur l'effet de l'union sur des composantes de la vie économique du ménage.

Le premier chapitre cherche notamment à explorer l'impact d'éléments extérieurs aux relations des conjoints sur le choix d'officialiser son union. En interrogeant l'effet de la fiscalité sur le choix de contracter un pacs, il cherche à regarder si des éléments financiers viennent expliquer le choix de l'union, indiquant alors la possibilité pour les pouvoirs publics de valoriser une union au moyen de la fiscalité. Le second chapitre s'intéresse à la réaction des couples à la diversification de l'offre de contrats de couple.

En cherchant à déterminer si le pacs s'est substitué, au moins partiellement, au mariage, il s'interroge sur la demande des couples pour plusieurs types de contrat, qui traduirait une certaine hétérogénéité des comportements des couples quant aux raisons expliquant le désir d'officialiser l'union. Le troisième chapitre questionne le rapport des couples avec le monde extérieur : il cherche à déterminer si le mariage peut être perçu comme un signal de la stabilité du couple vis-à-vis des banques au moment de contracter un crédit immobilier.

2.2 Les méthodes employées

Identifier des effets causaux : monde réel et contrefactuel

L'ensemble de cette thèse repose sur la détermination de l'effet causal d'une variable, appelée traitement, sur une autre, appelée variable d'intérêt ou encore outcome. Le traitement est souvent la mise en place d'une réforme, qui modifie l'évolution de certaines unités observées. L'outcome est alors la grandeur sur laquelle le traitement a un effet. Au cours de cette thèse, plusieurs variables sont assimilées à des traitements : la réforme de l'imposition des couples pacsés étudiée dans le chapitre 1 introduit une différence entre les trimestres, certains pouvant être considérés comme traités ; le fait d'être mariés est assimilé à un traitement dans le chapitre 3. Déterminer l'effet causal requiert l'identification du véritable impact du traitement, indépendamment des autres caractéristiques des individus auxquels on s'intéresse.

Le but est d'identifier l'effet causal car il s'agit de comprendre ce que change (ou ce que changerait) le fait d'être traité pour un individu, sans que cet effet résulte d'autres caractéristiques de l'individu. S'il résultait d'autres caractéristiques, la conclusion pourrait conduire à abandonner/promouvoir un traitement car on lui attribuerait à tort certaines vertus/vices qui proviennent du fait que les individus traités sont différents des individus non traités. La difficulté centrale de l'identification de l'effet causal

provient du fait que le contrefactuel est par nature inobservé : il indique ce qu'aurait été l'outcome si l'individu n'avait pas été traité, s'il l'a été, ou ce qu'aurait été l'outcome si l'individu avait été traité, s'il ne l'a pas été. Cette difficulté peut être résumée dans un cadre proposé par Rubin : soient y_i la valeur observée de l'outcome pour l'individu i, y_i^1 la valeur de l'outcome qu'on observerait si l'individu était traité, y_i^0 la valeur de l'outcome qu'on observerait si l'individu n'était pas traité et t_i une indicatrice indiquant si l'individu i est traité. On s'aperçoit alors qu'un seul des éléments du couple (y_i^0, y_i^1) peut être observé :

$$y_i = y_i^0 + t_i(y_i^1 - y_i^0)$$

L'effet du traitement, pour l'individu i est donné par la différence $(y_i^1 - y_i^0)$. Une seule des deux composantes étant observée, il est alors impossible de mesurer directement l'effet du traitement.

Afin de mesurer l'effet du traitement, l'idée fondamentale est d'approximer le contrefactuel à partir de l'échantillon observé : s'il n'est pas possible d'observer le même individu dans deux états de la nature différents, il est possible d'observer des individus différents dans des situations différentes, dans un état de la nature. Du point de vue de l'économètre, les individus se distinguent selon deux critères : ils peuvent avoir des caractéristiques observables (par l'économètre) différentes et des caractéristiques inobservables (de l'économètre) différentes. Si les individus ont des caractéristiques différentes, la comparaison directe des traités et des non traités ne peut pas renseigner sur l'effet causal du traitement, car cela revient à penser que les traités, s'ils n'étaient pas traités, auraient le même outcome que les non traités, et vice-versa. Or, si la différence de caractéristiques observables est directement testable, la différences de caractéristiques inobservables ne peut être qu'inférée.

L'approximation du contrefactuel à partir des données observées dans l'échantillon a pour but de réduire au maximum les différences entre les outcomes des traités et des

non traités qui sont dues aux différences de caractéristiques. Plusieurs méthodes sont développées au cours de la thèse pour répondre à cette exigence.

Le matching est une méthode d'estimation non paramétrique dont le but est de reconstruire pour chaque unité traitée une approximation de son contrefactuel à partir des unités non traitées. Le matching s'appuie sur l'hypothèse fondamentale que les caractéristiques observables permettent de corriger toute différence associée aux observables et inobservables. Ainsi, toute la différence directement observée entre les outcomes des traités et des non traités est l'effet causal du traitement, auquel vient s'ajouter l'effet sur l'outcome de certaines caractéristiques observables, sans préciser la forme paramétrique de ces effets. L'effet des caractéristiques est neutralisé par l'approximation du contrefactuel reconstruit au moyen des caractéristiques observables. La comparaison des unités traités aux contrefactuels ainsi reconstruits permet de mesurer l'effet du traitement. Ainsi, la mise en place de la méthode de matching s'articule autour de deux étapes centrales. La première est le choix des caractéristiques observables permettant de corriger la différence entre traités et non traités issue de différentes caractéristiques observables et inobservables, car de celui-ci dépend l'interprétation causale des résultats de l'estimation. La seconde est la reconstruction du contrefactuel à partir des unités non traitées. L'idée est de reconstruire pour chaque unité traitée son contrefactuel en repondérant les unités non traitées, ce qui permet de reconstruire un individu non traité ayant des caractéristiques similaires à celles de l'individu traité. Plusieurs façons de calculer les poids ont été proposées, elles sont détaillées au cours du chapitre 3 de cette thèse.

La différence de différences s'appuie sur la possibilité de distinguer un groupe de contrôle d'un groupe de traitement et de suivre l'évolution de l'outcome dans le temps, pour ces deux groupes. L'idée fondamentale de la différence de différences est que le groupe de contrôle indique comment le groupe traité aurait évolué

s'il n'avait pas été traité (hypothèse de tendance commune). Les deux groupes ne sont pas nécessairement similaires, à condition que les caractéristiques qui les différencient n'impliquent pas des évolutions différentes. Si l'hypothèse de tendance commune est vérifiée, l'effet du traitement est aisément identifiable : puisque le point de départ (avant traitement) est observé et l'évolution qui aurait du être observée, en l'absence du traitement, est donnée par l'observation de l'évolution du groupe de contrôle, il est aisé de reconstruire ce qu'aurait dû être l'outcome moyen du groupe traité en l'absence de traitement. L'étape clé de cette méthode est alors de distinguer un groupe de contrôle adéquat au groupe de traitement. Les problèmes soulevés par l'inadéquation du groupe de contrôle sont détaillés au cours du chapitre 1. Il est important de noter que contrairement au matching, la méthode de différence de différences n'impose pas de corriger des inobservables à partir des observables, mais elle impose que les inobservables du groupe traité ne jouent pas sur l'évolution de l'outcome de ce groupe.

Aucun groupe de contrôle ne peut être identifié si l'ensemble de la population est traitée en même temps, en particulier lorsqu'une réforme est mise en place de façon similaire sur l'ensemble du territoire. Il est alors difficile d'identifier les effets causaux de la réforme, en raison du manque d'éléments de comparaison. Seuls des éléments suggérant l'effet du traitement peuvent alors être apportés, en prolongeant par exemple l'évolution avant la mise en place du traitement et en comparant cette évolution supposée à l'évolution observée. Le chapitre 2 ne parvient pas à identifier clairement des effets causaux du pacs sur le mariage, il propose néanmoins quelques éléments suggérant le lien entre les deux contrats en prolongeant après la création du pacs l'évolution des quantiles de la distribution observée avant sa création.

Décrire la distribution : Moyenne et quantiles

Les méthodes présentées plus haut permettent d'identifier l'effet moyen du traitement sur l'outcome. En d'autres termes, elles regardent comment le traitement fait varier la moyenne de l'outcome. Néanmoins, la moyenne est un paramètre parmi d'autres décrivant la distribution de l'outcome. En particulier, les quantiles de la distribution peuvent apporter des éléments de réponse à des questions portant sur l'évolution de la distribution de l'outcome. Par ailleurs, des paramètres comme la moyenne ou la variance d'une distribution sont difficilement observables dès lors que la distribution de l'outcome n'est pas observée dans son ensemble. En revanche, les premiers quantiles de la distribution peuvent être observée, même dans le cas d'une distribution censurée.

Les chapitres 1 et 3 s'intéressent à l'effet moyen du traitement sur l'outcome car ils cherchent à déterminer si le traitement a eu, en moyenne, un effet sur l'outcome et si cet effet est important. En revanche, le chapitre 2 s'intéresse aux quantiles de la distribution car il regarde si la distribution des âges au mariage a été modifiée suite à la mise en place du pacs, afin de détecter un éventuel décalage de l'âge au mariage, en particulier pour les jeunes cohortes. L'âge moyen au premier mariage n'est pas observé pour les jeunes cohortes, néanmoins, le bas de la distribution est d'ores et déjà observable.

Paramétrique et non paramétrique

Au delà des hypothèses sur les caractéristiques observables et inobservables des individus, l'identification repose souvent sur l'estimation d'un modèle précis, qui impose des restrictions paramétriques à la façon dont le traitement influence l'outcome. En effet, le modèle estimé impose une forme paramétrique précise au lien entre les deux variables. Si cette forme paramétrique est une mauvaise approximation du lien qui unit le traitement et l'outcome, l'identification repose sur des hypothèses fausses, ce qui affaiblit la portée du résultat estimé. Il convient alors de limiter au maximum

la paramétrisation du modèle, afin d'éviter que l'identification repose exclusivement sur les hypothèses paramétriques du modèle. Dans ce but, le chapitre 1 propose de mesurer l'effet du traitement et son évolution dans le temps en intégrant un ensemble d'indicatrices pour les années croisées avec le groupe de traitement, ce qui permet de mesurer comment évolue le groupe de traitement par rapport au groupe de contrôle sans pour autant imposer une forme paramétrique à la façon dont l'effet du traitement évolue au cours du temps. Le chapitre 2 impose une forme paramétrique à l'évolution de chaque quantile, ce qui affaiblit l'identification des résultats. Néanmoins, aucune forme paramétrique, ni semi-paramétrique, n'est imposée à la distribution conditionnelle de l'outcome, contrairement aux méthodes classiques de modèles de durée. Le chapitre 3 n'impose aucune forme paramétrique au lien entre traitement et outcome, permettant ainsi de distinguer l'effet de traitement sur les traités de l'effet portentiel du traitement sur les non traités.

2.3 Plan de thèse

Cette thèse s'articule autour de trois questions principales.

La fiscalité des couples pacsés a-t-elle participé au succès du pacs ?

Au cours de ses 10 premières années d'existence, le pacs a séduit près de 700,000 couples. Si le nombre de pacs contractés par des couples homosexuels n'a cessé d'augmenter, c'est surtout l'augmentation du nombre de pacs contractés par des couples hétérosexuels qui a pu surprendre. En 2009, 95% des couples pacsés sont hétérosexuels. Pourtant, alors que le pacs était encore en gestation, un sondage publié dans *Libération* le 8 septembre 1998 affirmait que 57% des concubins hétérosexuels étaient intéressés par le pacs (Martel, 2000)[26] et l'INED estime dès 1999 que le nombre de

26. Frédéric Martel, *Le Rose et le Noir*, Editions du Seuil, Collection Points Essais, p.626

pacs contractés pourrait atteindre les 150-200,000 par an (Rapport de l' INED, 1999).

Le succès du pacs s'explique certainement par le fait qu'il répond aux attentes des couples, leur permettant effectivement d'"organiser leur vie commune" [27]. Le chapitre 1 interroge le rôle que joue la fiscalité sur l'augmentation du nombre de pacs : l'imposition des couples pacsés est calquée sur celle des couples mariés, mais associée à un contrat de couple moins engageant. La fiscalité ne semble jouer qu'un rôle mineur dans le choix de se marier, quoique significatif (Buffeteau and Echevin, 2008) : une analyse coûts-bénéfices indiqueraient alors que les gains associés à une fiscalité avantageuse sont moins importants que les coûts engendrés par le mariage. Le pacs est un contrat de couple pour lesquels les coûts de séparation sont moins importants que pour le mariage [28] : ainsi, la fiscalité peut s'avérer plus déterminante dans le choix de contracter un pacs. Le but est donc d'estimer, parmi les couples pacsés, combien peuvent être attribués au dispositif fiscal.

La stratégie d'identification s'appuie sur la réforme de 2005 de la fiscalité des couples pacsés. Avant 2005, les partenaires pacsés devaient attendre l'année marquant le 3^e anniversaire du pacs pour déclarer conjointement leurs revenus. La date précise à laquelle le pacs était contracté n'avait pas d'effets sur le montant d'impôt dû 3 ans plus tard, seule l'année du pacs comptait. La loi de finance 2005 aligne le dispositif fiscal des couples pacsés sur celui des couples mariés : depuis le 1^{er} janvier 2005, les partenaires pacsés déclarent conjointement leurs revenus dès la date d'enregistrement du pacs. Dès lors, l'impôt dû par le couple pour l'année au cours de laquelle le pacs est contracté dépend de la date de signature du pacs : chaque couple peut minimiser le montant d'impôts à payer en se pacsant au cours d'une certaine période optimale. La période optimale dépend du revenu total imposable et de la différence entre les revenus des partenaires, mais survient dans la plupart des cas au cours du 2^e ou 3^e trimestre. L'effet de la fiscalité sur le taux de pacs par tribunal d'instance est estimé

27. Art 515-1 du Code Civil, définissant le pacs
28. Un pacs est plus facile à dissoudre, car il ne requiert pas nécessaire de passer devant un juge.

par différence de différences en comparant l'évolution des taux de pacs contractés au cours des trimestres pour lesquels le pacs a peu d'influence sur le montant d'impôts dû (1^{er} et 4^{e} trimestres), alors considérés comme groupe de contrôle, à l'évolution des taux de pacs contractés au cours des trimestres pour lesquels le montant d'impôt est fortement affecté par la date du pacs, alors considérés comme groupe de traitement. L'effet estimé de la fiscalité sur les taux de pacs est important : le taux de pacs pour 1000 habitants âgés de 15 à 59 ans augmente de 0,469 points en 2005 et de 1,33 points en 2009, ce qui représente plus de 30% des couples pacsés.

Néanmoins, cette stratégie est remise en cause par la possibilité pour les couples d'ajourner leur pacs à une période plus propice d'un point de vue fiscal : si certains couples retardent leur pacs pour se pacser pendant l'été plutôt que pendant l'hiver (effet calendrier), l'estimateur par différence de différences surestime l'effet de la réforme fiscale sur le taux de pacs. Je propose donc une méthode inspirée des triple différences pour distinguer l'effet incitatif de l'effet calendrier de la fiscalité. Cette méthode permet d'estimer des bornes de l'effet incitatif réel de la réforme de l'imposition des partenaires pacsés. Les résultats indiquent que le taux de pacs pour 1000 habitants augmente de 0 à 0,14 points en 2005 et de 0,65 à 0,85 points en 2009. En d'autres termes, de 16% à 21% des couples pacsés en 2009 peuvent être attribués à l'incitation fiscale.

La réforme prévoit également le même dispositif pour l'année au cours de laquelle le pacs est dissous. Charles de Courson craignait que le dispositif ne soit détourné [29], car il est alors possible de minimiser le montant d'impôts dû en se pacsant et se dépacsant une année sur deux. Toutefois, les résultats indiquent que ce type de comportement est

29. Charles de Courson, lors des débats sur le Projet de loi de finances pour 2011 : Articles de la deuxième partie" : "Lorsque nous avons discuté de la création du PACS, j'ai soulevé le problème, en indiquant que je publierais une annonce dans *Le Nouvel Observateur* ainsi libellée : "Célibataire cherche étudiante sans revenu en vue signature PACS de six mois pour partage avantage fiscal." Car le mécanisme projeté permettait de se "pacser" chaque 1er janvier et de se "dépacser" chaque 1er juillet. Ce risque de détournement de l'objectif civil du mécanisme a entraîné l'adoption d'un amendement fixant une durée minimale de trois ans pour bénéficier de l'avantage fiscal. Mais notre majorité a, hélas, supprimé cette clause, contre mon avis. Nous assistons donc à des débuts de détournement de la loi"

trop marginal pour être détecté : la fiscalité ne semble pas avoir d'effet sur la décision de dissoudre un pacs.

Ainsi, la fiscalité a joué un rôle non négligeable dans l'augmentation du nombre de pacs contractés en France et son impact a tendance à se renforcer au cours du temps, sans pour autant inciter les couples à dissoudre leur pacs. La réforme fiscale des couples pacsés modifie principalement le montant d'impôts sur le revenu de l'année du pacs. Ainsi, une incitation fiscale, qui n'affecte que ponctuellement le couple, peut modifier durablement son comportement matrimonial.

La contribution essentielle de ce chapitre est double. D'abord, en s'intéressant à l'influence de la fiscalité sur les comportements matrimoniaux des couples, il apporte une nouvelle réponse à une question déjà abordée dans la littérature économique qui concluait que la fiscalité ne joue pas ou peu sur les comportements des couples. Les résultats sont originaux car ils indiquent que les couples sont sensibles aux incitations fiscales, quand il s'agit de conclure un pacs, union moins engageante et moins symbolique qu'un mariage. Il renseigne donc sur la possibilité d'inciter les couples à rendre officielle leur union en augmentant leurs revenus, même ponctuellement. Ensuite, ce chapitre apporte une contribution technique, en proposant une méthode inspirée de la triple différence, qui permet d'estimer des bornes à l'effet causal d'un traitement même si le groupe de contrôle est aussi affecté par le traitement. Cette méthode est innovante car elle n'a jamais été développée à ma connaissance.

Le pacs se substitue-t-il au mariage ?

Alors que les premières formes d'union civile, alternatives au mariage voient le jour en Europe, la France emprunte un chemin original. Le Danemark (1989), la Norvège

(1993) et la Suède (1995) sont les premiers pays à mettre en place une union civile, ou partenariat enregistré, dont le but est de proposer une forme d'union proche mais distincte du mariage, exclusivement réservée aux couples homosexuels. Les débats en France sur la possibilité d'ouvrir une union civile aux couples homosexuels prennent dès les débuts une tournure différente. Portée par Jean-Luc Mélenchon devant le Sénat en 1990, la première proposition de loi cherche à définir un cadre juridique aux personnes partageant leur vie sans être mariées : couples homosexuels, fratries, ou couples hétérosexuels ne désirant pas se marier. Toutes les tentatives proposées par la suite, dans les années 1990 (CUC, CVS, CUS, PIC puis PACS) s'appuient sur l'idée d'offrir une reconnaissance légale à la communauté de vie des duos non mariés.

Les opposants à toute union alternative au mariage y voient une tentative pour déstabiliser le mariage : la reconnaissance légale des couples homosexuels irait à l'encontre de la protection de la famille et l'ouverture d'une forme d'union alternative concurrencerait le mariage, considéré comme le seul cadre juridique assurant la stabilité du couple. En ce sens, en 1995, Jacques Toubon (alors Garde des Sceaux) rejette la proposition de loi sur le CUC (Contrat d'Union Civile) en affirmant : "[...] Il n'est donc pas question de créer le contrat d'union civile, il est au contraire question de favoriser dans le pays les mariages et les naissances pour que la France soit plus forte !" [30] Ainsi, la question de la substitution entre les deux formes d'union se pose dès la genèse du contrat : c'est en partie parce que Jacques Toubon voit dans le CUC un concurrent du mariage qu'il rejette toute proposition allant dans le sens de la création d'une forme alternative de contrat de couple.

Dix ans après la création du pacs, alors que le nombre de pacs a fortement augmenté, le nombre de mariage a peu baissé. Le mariage est-il affecté par la mise en place du pacs ? Pacs et mariage sont deux contrats distincts mais possèdent un certain nombre de points communs. La question de la substitution entre pacs et mariage en

30. Deuxième séance du 29 novembre 1995 (*JO* du 30 novembre)

termes d'usage qu'en font les couples permet de mieux comprendre les stratégies matrimoniales et les raisons pour lesquelles les couples décident d'enregistrer légalement leur union. Elle permet de rendre compte de l'hétérogénéité des dynamiques conduisant à une vie commune et sous quel contrat les couples préfèrent organiser leur vie commune, en se demandant s'il existe une demande distincte pour deux contrats matrimoniaux.

Le chapitre 2 interroge la question de la substitution entre pacs et mariage en regardant si les individus substituent, au cours de leur vie, à des périodes de mariage des périodes de pacs. Une telle substitution peut être repérée par l'évolution entre cohortes de la distribution des âges au mariage. Le chapitre explore d'abord quels aspects la substitution entre pacs et mariage peut prendre. Deux types de substitution peuvent être envisagés : une substitution de long terme, indiquant que le pacs tant à remplacer définitivement le mariage pour certains couples ou une substitution de court terme, indiquant que le pacs tend à retarder le mariage. Ces deux *scenarii* renvoient à deux notions souvent utilisées pour décrire le calendrier des événements marquant la vie d'un individu en démographie : le quantum et le tempo.

Je commence par analyser l'évolution du quantum et du tempo en construisant les outils classiques de l'analyse d'événements par période : âge moyen au premier mariage et indice conjoncturel de nuptialité. Cette première analyse indique que la structure par âge de la population explique l'augmentation du nombre de mariage jusqu'au début des années 1970. Depuis, la baisse s'explique par la baisse des taux au mariage. L'indice conjoncturel de nuptialité est stable depuis le milieu des années 1980, mais cette stabilité résulte d'un double mouvement : alors que le taux de nuptialité des plus de 30 ans augmente puis se stabilise, celui des jeunes de 24 ans chute très fortement et celui des 24-30 ans diminue depuis la création du pacs. Les âges au premier mariage sont similaires aux âges des personnes pacsées.

Afin d'analyser l'évolution des âges au premier mariage de cohorte en cohorte, définies par l'année de naissance, je reconstruis l'écoulement de la cohorte dans le mariage.

Celui-ci est défini par la fonction de répartition des âges au premier mariage, pour une cohorte donnée. Un changement de la distribution des âges au premier mariage se traduit par un changement des fonctions quantile, conditionnelles aux cohortes, mesurées à plusieurs quantiles. J'étudie l'évolution par cohorte des quantiles de la distribution des âges au mariage. Je montre que sous l'hypothèse d'une certaine stabilité de l'évolution de la fonction quantile conditionnelle aux cohortes, toute déviation par rapport à cette évolution peut être interprétée comme l'impact du pacs sur le mariage. Loin de valider l'hypothèse de substitution entre pacs et mariage, les résultats des régressions quantiles indiquent que les plus bas percentiles de la distribution ont eu tendance à se stabiliser après la création du pacs. Cet effet inattendu tend à indiquer que les hypothèses nécessaires à l'interprétation causale sont trop fortes. L'étude de l'évolution des distances interquantiles fait reposer l'interprétation causale de l'effet du pacs sur le mariage sur des hypothèses moins fortes. La technique employée se rapproche de la méthode de différence de différences et consiste à étudier comment évolue de cohorte en cohorte un quantile correspondant à un rang plus élevé dans la distribution par rapport à un quantile correspondant à un rang plus bas dans la distribution des âges au premier mariage. L'interprétation causale repose sur l'hypothèse de stabilité de la distance interquantile : en d'autres termes, le quantile le plus bas indique ce qu'aurait été l'évolution du quantile le plus élevé si le pacs n'avait pas existé. Les résultats montrent que la mise en place du pacs n'a eu que peu d'effets sur l'âge au premier mariage : les quantiles intermédiaires ont eu tendance à augmenter légèrement après la mise en place du pacs.

Cette analyse tend à appuyer l'idée que le pacs et le mariage s'adressent à des populations différentes ou qu'il est contracté par des couples à des périodes de leur vie au cours de laquelle ils ne se seraient pas forcément mariés. Il peut néanmoins affecter des individus se mariant à des âges intermédiaires, indiquant alors une faible substitution entre pacs et mariage pour ceux qui se marient plus tard, ayant donc un

attachement plus faible au mariage.

La contribution essentielle de ce chapitre est d'apporter des éléments de réponse aux raisons expliquant le choix d'officialiser son union. En montrant que le choix de se marier ne semble pas être affecté par l'existence d'un contrat alternatif pour le couple, il montre qu'il existe une demande pour plusieurs types de contrat et que diversifier l'offre de contrats matrimoniaux permet de satisfaire des demandes différentes, auprès de populations différentes. Ce chapitre apporte alors des éléments de réponse supplémentaires aux travaux s'interrogeant sur les raisons pour lesquels les couples se marient.

Le mariage favorise-t-il l'accés au crédit immobilier ?

Le mariage régit les relations interpersonnelles entre les conjoints, mais ce n'est pas un contrat privé : il définit un statut matrimonial et se place comme une institution publique. En ce sens, l'émission de bans et la présence de témoins sont nécessaires à sa validité. Le mariage est également coûteux, car il représente un engagement qu'il est coûteux de dissoudre en raison des frais de divorce. Ainsi, le mariage peut servir de signal auprès d'agents tiers qui engagent une relation économique de long terme avec le couple.

Le chapitre 3 teste l'hypothèse selon laquelle le mariage peut servir de signal en s'intéressant à l'accès au crédit immobilier des ménages. L'agent prêteur peut avoir intérêt à ce que le couple ne se sépare pas ou le plus tard possible, dans la mesure où une séparation induit des coûts de renégociation du prêt et un risque accru de défaut. Le chapitre cherche à tester si les couples mariés ont plus facilement accès au crédit immobilier que les couples non mariés et si les conditions d'accès leur sont plus avantageuses.

La notion de contraintes de crédit peut se décliner sous plusieurs formes : un couple est contraint à la marge extensive s'il veut emprunter mais qu'il ne le peut pas. Il est alors contraint à rester locataire de son bien. Un couple est contraint à la marge intensive s'il veut emprunter plus que ce que les conditions d'emprunt lui permettent.

L'estimation de l'effet du mariage sur les contraintes de crédit est sujette à deux difficultés majeures. Une première difficulté provient du fait qu'il est impossible d'observer les contraintes de crédit : tous les locataires ne sont pas forcément contraints à la marge extensive car certains peuvent ne pas éprouver l'envie d'être propriétaire de leur bien. Définir la contrainte à la marge intensive nécessite de pouvoir observer le montant emprunté si l'agent pouvait lisser sa consommation sur le cycle de vie, et de le comparer au montant réellement emprunté. Je dérive le statut de "contraint" en utilisant des méthodes classiques de la littérature portant sur les contraintes de crédit. Afin de déterminer si les agents sont contraints à la marge extensive, j'utilise des données déclaratives indiquant si les couples ont eu envie d'emprunter dans un passé proche. Les contraintes de crédit à la marge intensive sont déterminées en imposant une borne supérieure au montant que les individus peuvent emprunter étant donnés leurs revenus : ceux qui sont proches de cette borne supérieure sont considérés comme contraints. On observe alors les conditions d'emprunt pour ceux qui sont considérés comme contraints à la marge intensive. La deuxième difficulté majeure provient du fait que les couples mariés et les couples non mariés ne sont pas directement comparables en raisons de caractéristiques observables et inobservables différentes. Néanmoins, la décision d'accorder le prêt au couple revient à l'organisme prêteur (nommé par le terme générique de banquier par la suite) : une régression OLS classique donne une estimation biaisée de l'effet du mariage sur les contraintes de crédit si les caractéristiques inobservables importantes aux yeux du banquier sont corrélées au statut matrimonial du couple et si la distribution jointe des caractéristiques observables ne s'appuie pas sur le même support pour les couples mariés et les couples non mariés. En supposant

que les caractéristiques importantes pour le banquier sont observées par l'économètre, la question de distribution des caratéristiques observables peut être résolue en utilisant des méthodes de matching, afin de construire un contrefactuel aux couples mariés à partir de l'échantillon de couples non mariés.

En m'appuyant sur les données issues de l'*Enquête Logement 2002*, j'estime l'effet du mariage sur les contraintes à la marge extensive et sur les contraintes à la marge intensive. Je propose plusieurs façons de calculer les poids nécessaires à la construction du contrefactuel afin de tester la robustesse des méthodes de matching. Les résultats indiquent que le mariage semble peu jouer dans l'attribution des prêts par le banquier, mais les couples mariés sont moins facilement découragés que les couples non mariés. En considérant une définition large des contraintes de crédit, qui inclue les couples découragés parmi les couples subissant des contraintes de crédit, le fait d'être marié diminue significativement la probabilité d'être contraint d'environ 2.8 points de pourcentage, ce qui correspond à une baisse de 53% du nombre de couples contraints. En revanche, les résultats portant sur les contraintes de crédit à la marge intensive indiquent que le fait d'être marié joue peu sur les conditions d'accès au crédit, sauf pour le coût global de l'emprunt. De façon surprenante, les couples mariés ont tendance à disposer d'un crédit qui leur revient plus cher que les couples non mariés. Les deux résultats peuvent traduire un effet de sélection des couples au cours du processus d'obtention d'un crédit : les couples dans une dynamique de fonder un foyer sont plus à même d'être mariés. Ils ont également tendance à être moins découragés, et donc à accepter des prêts pouvant être plus chers.

En s'interrogeant sur les conséquences économiques du mariage au niveau du couple, la contribution principale de ce chapitre est de montrer que le mariage n'est pas nécessairement un contrat qui permet de gérer les rapports interpersonnels des conjoints, mais qu'il peut modifier les relations du couple avec les tiers, en particulier

au moment de l'obtention d'un crédit immobilier. Les résultats tendent néanmoins à indiquer que le statut matrimonial a peu d'effet sur la capacité du couple à obtenir un crédit. Il présente toutefois des résultats originaux : les couples non mariés auraient tendance à bénéficier de meilleures conditions de crédit, qui peuvent être expliquées par un effet de sélection des couples dans le mariage, corrélé à la volonté d'investir dans l'achat de la résidence principale. Par ailleurs, ce chapitre explore différentes méthodes de matching et montre que les résultats ne sont pas neutres à la méthode employée.

CHAPITRE 2

Would you civil union me ? Did the reform of income taxation boost civil union rates in France ?

1 Introduction

Marriage markets have changed a lot since Becker's seminal theory of marriage (1973; 1981). Both in the US and in Western Europe, the most notable changes are the increasing divorce rate and the decreasing marriage rate. These changes tend to show that marriage is no longer a cohabitation contract that goes without saying. Today, the why and when couples get married is a choice.

In a classic cost/benefit framework, couples decide to marry if their utility when married is greater than when cohabiting. Therefore, an attractive taxation for married couples should marginally impact the marriage rate : the more benefic the taxation of married couples, the higher the marriage rate. In the analysis of the marriage contracts proposed by Matouschek and Rasul (2008), an attractive taxation of married couples

can be considered as an exogenous benefit given to married couples. They show that it should increase the marriage rate, through an increase of low quality couples' marriage (low quality couples meaning high probability of divorce). But if the cost of marriage is high, the elasticity of marriage to taxation could be low. Therefore, examining the link between marriage and taxation is an empirical question.

The empirical literature tends to support the idea that taxation slightly impacts marriage rates. Papers by Alm and Whittington (1995; 1999) show that if significant, the impact of taxation on marriage rate is small in the US. They use the heterogeneity of the 'marriage penalty' in the US to identify the effect. However, the variations of 'marriage penalty' are not very important, weakening the identification strategy. In France, Buffeteau and Echevin (2003) study the impact of the reform of taxation for cohabiting couples with children in 1995. They show that couples are sensitive to taxation : the probability of marriage has increased by about 5 points for young cohabitant couples with children.

Maybe couples do not react much to fiscal incentives because the cost of marriage is high compare to its fiscal benefit [1]. In particular, the symbolic cost of marriage is still high in France and the cost of divorce is still important. In that case, what would happen if marriage was less symbolic and divorce less costly ? It would change the overall cost of marriage : by changing the balance between costs and benefits, it could change the incentive to react to the benefits of marriage.

In France, different-sex couples can choose between two kind of marital contracts. The pacs [2] was created the November 15^{th}, 1999. It aimed at giving same-sex couples a marital contract as same-sex couples can not marry in France. It was the consequence of one year of very tense debates. It was made as a median way between cohabitation and marriage. It gives more rights and duties to the partners than cohabitation but less than marriage (Waaldijk, 2005). Especially, one important difference is that it

1. There is no 'unilateral divorce' in France.
2. Pacs stands for *Pacte Civil de Solidarité*, Civil Pact of Solidarity.

is easier to break up a pacs than a marriage and that it is less symbolic : pacs are contracted at a court and marriage at the town hall. Other differences (debt, survivor's pension, adoption, citizenship) are summarized in table 3.1. Since it was created, the pacs had been popular among both different-sex and same-sex couples : the number of pacs contracted increased from 20,000 in 2000 to 172,000 in 2009 [3] (excluding overseas *départements*). The pacs has been modified twice since it was created. Income taxation was different for pacsed partners compared to married partners, it has been reformed in 2004 and taxation of pacsed couples had been made similar to income taxation of married couples. In 2006, rights and duties of pacsed partners changed and the pacs became a more binding contract, although it is still not as binding as marriage is because it is easier to break than a marriage. The increasing number of pacs has been largely attributed to the profitable taxation of pacsed couples, although this idea has not been verified.

In France, the tax system takes into account the size of the household (including children) but tax units are defined by the matrimonial status. Cohabiting couples have to fill two separate tax returns, and pacsed and married can declare jointly their income so they fill only one tax return. This system of joint taxation of married/pacsed couples makes them pay less taxes, especially if the difference between the spouses' incomes is large. The year of the marriage/pacs, couples have to fill three tax returns : each spouse fills its own to declare the income earned before the marriage, and they jointly fill one for the incomes earned after the marriage. This system leads to large gain on taxes for couples, especially if they marry/pacs in the middle of the year. Therefore, it divides the year between an attractive part and an unattractive part to contract a pacs. The goal of the paper is to test the idea that taxation boosted pacs rates. For that purpose I analyze the 2005 reform of taxation of pacsed couples. Before 2005, pacsed

3. The pacs is now so popular in France that the terminology has changed. A new verb was created "se pacser" that I translate into "to pacs", meaning "to contract a pacs". The verb "se pacser" appears now in the French dictionary *Larousse*.

partners could not directly jointly fill one tax return right after the pacs but they had to wait for three additional years before pooling their income for taxation issues. Married couples could jointly declare their income right after the marriage. After 2005, pacsed partners jointly declare their income right after the pacs. Therefore, the day of the pacs did not matter before the reform but it does after the reform. The same system is applied for the year the pacs is broken up. I analyze the impact of the reform in a difference-in-difference framework. I assume that the reform has two impacts : first, it increases the pacs rate, second some couples may delay their pacs from the unattractive part of the year to the attractive part. I show that a simple difference-in-difference approach, that compares the evolution of pacs rates during the attractive part of the year to the pacs rate contracting during the unattractive part of the year does not identify the effect of the reform. I propose an adaptation of the simple difference in difference approach that permits identifying the two impacts of the reform. My results suggest that the reform had a significant impact, 15-20% of the pacs contracted after 2005 can be attributed to the reform. However, I do not find any significant effect of taxation on the decision to break up a pacs.

The rest of the paper proceeds as follow. Section 2 explains the French system of income taxation for married and pacsed couples. Section 3 describes the data and some summary statistics. Section 4 presents the identification strategy, section 5 shows the estimates of the impact of the income tax reform on the number of pacs contracted and on the dissolution of pacs. Section 6 proposes an interpretation of the results and section 7 concludes.

2 Civil Union, the income tax system in France and the reform in 2005

2.1 The pacs : history and main changes

Demographic trends show that the use of marital institutions changed in France over the last decades.

With 3.97 marriage for 1000 inhabitants in 2007, the marriage rate in France is lower than the average marriage rate in OECD countries (5 in 2007) and much lower than in the United-States (7.31 in 2007). Couples tend to marry less and if they do, they marry older. In France, the marriage rate was about two times higher in 1970 with 7.75 per 1000 persons (OECD, 2010). Moreover, in 2008, the age at the first marriage in 29.7 for women and 31.6 for men. It was 26.7 and 28.6 in 1990. Then, marriage often occurs after a long period of cohabitation. In 2006, in France, 38% of men and women aged between 25 and 29 lived with their partner and are not married whereas 22% are married (INSEE, 2009). But describing marriage rates give a partial story of the marital strategies in France because marital institutions also changed.

One of the most important change in the institution of marriage in France was the creation of the pacs[4], a new legal form of union. It was inspired by other European countries. In 1987, Denmark paved the way to other countries by creating a new legal form of union, *the registered partnership*. Then, a lot of countries (mostly European) created registered partnerships or civil unions[5]. They targeted same-sex couples and their claim for legal recognition. As same-sex couples had become an important lobby, their legal recognition was highly demanded. But the report directed by Waaldijk (2005) shows that the rights given to partners by civil unions are very different from one country to another. Most countries decided to create a median way between marriage

4. *Pacte Civil de Solidarité*, Civil pact of solidarity
5. Let's call civil unions all that new legal forms of unions.

and cohabitation. In Netherlands or in Sweden, civil unions are very close to marriages. In France or in Belgium, at least when it was created, civil unions were very different from marriage. Three main features distinguish most of civil unions from marriages, whatever the country. First, partners are less committed because duties towards the other partner are weaker. Second, civil unions do not give as many benefits to partners as marriage do. Third, civil unions are easier to break. In most countries, civil unions are exclusively made for same-sex couples. The French system is quite different. As in the Netherlands or in Belgium, different-sex couples can contract a civil union, although pacs targeted same-sex couples when it was created. Therefore, it provided an alternative to the marriage for different-sex couples in a context of decrease in the use of marriage, even if it was not its main goal. During the years following its creation, the pacs turned to be successful, especially among different-sex couples. In France, from its creation in 1999 to the end of 2009, 697,779 pacs have been contracted (excluding overseas *départements*, DOM). From 22,276 pacs contracted in 2000 to 172,104 in 2009, the pacs turned to be very successful. In 2009, 40% of the unions celebrated were pacs. Different-sex couples have found a legal form that fits very well their need : the Ministry of Justice declared that in 2007 only 7% of new pacs were contracted by same-sex couples (?) and this proportion is still decreasing (INSEE, 2009). The increase of pacs compensates the decrease of the marriage rate : 6.71 unions (pacs+marriages) for 1000 persons were contracted in France in 2009 (5.5 in 2000).

The success of the pacs was unexpected. When the pacs was created, the political area was highly divided on the topic and nobody predicted such a success. The political issue was mostly giving a legal recognition to same-sex couples or not. The effect of such a contract on different-sex couples was not debated. In 1999, the pacs was creating and legal dispositions made it different from the marriage but still attractive enough to satisfy same-sex couples claims for recognition. It was made to give

a legal recognition to couples but without the symbolic meaning of marriage. Except the symbolic meaning, there were three main differences between the marriage and the pacs. First, the pacs was not (and is still not) recognized as a matrimonial status. This leads to different access to social benefit such as alimonies or survivor's benefit. Second, married couples benefited more from the tax system than pacsed couples. Third, it was easier to break out a pacs than a marriage. However, the success of the pacs made it difficult to sustain some inequality of treatment between the different types of couples. Therefore, three reforms have made the pacs closer to the marriage. In 2005, the income taxation has been made similar for pacsed couples and married couples. This change results from the claim for equity between couples, as there was no reason why a pacsed couple would be taxed differently from a married couple. Before 2005, pacsed couples were taxed differently from married couples. Especially, couples benefited from an attractive taxation the year they got married but not the year they get pacsed (this system is explained below). The reform was announced in September 2004 and settled on the 1^{st} of January 2005. A more general reform was voted in June 2006 and was settled on January 2007. Its goal was to strengthen the commitment between pacsed partners. And in 2007, inheritance tax system was changed both for pacsed and married couples. They are now the same for both types of couple. Then, the 2005 reform coupled with the 2007 reform made the tax system similar for both married and pacsed couples. Taxation makes the pacs attractive, and the anti-pacs politicians pointed out that it was too benefic for a contract easy to break up as they feared tax evasion. The increasing number of pacs contracting raises questions. Which couples get pacsed ? Why do they contract a pacs ? Is the pacs a substitute to the marriage, a first step toward marriage or a substitute to cohabitation ? But, it is difficult to explain the growing number of pacs because a very few data are available on pacsed couples and pacsed couples are mostly unknown. **?** describes that they are as old as married couples and that despite they are easier to break, pacs are not more

broken than marriages. Both the relationship between marriage, pacs and cohabitation and the reason to contract a pacs are difficult to understand because of the lack of data. The increasing success of the pacs has been read as tax-related (INSEE, 2009; ?) although no study assess a link between taxation and the decision to contract a pacs.

2.2 The tax system of pacsed couples in France

Today, married and pacsed couples are taxed the same way in France. The next paragraph describes married couples but it is relevant for pacsed couples.

The income tax is a progressive tax calculated on the income earned within the year. First of all, a 10% relief is applied, then only 90% of the annual income is submitted to the income taxation. The amount of income up to a certain amount t_1 is taxed at a rate r_1, then the remaining money, up to a certain amount t_2 is taxed at rate r_2, etc... The amount $t_{i+1} - t_i$ is taxed at a rate r_i, with $r_{i+1} > r_i$. So, the income tax on the income I can be represented by f, a piecewise linear continuous and convex function.

A tax relief targets low-income households. If the amount of tax is less than an amount D, so if $f(I) < D$, the household does not pay exactly $f(I)$ but it benefits from a tax relief which is important if $f(I)$ is very low.

Let g be the amount paid by the household. Therefore,

$$g(I) = \begin{cases} \max\left(f(I) - \frac{D-f(I)}{2}, 0\right) & \text{if } f(I) \leq D \\ f(I) & \text{if } f(I) > D \end{cases}$$

The fiscal administration considers tax units, which size s depend on the matrimonial status and the number of children. For a single, the size is equal to $(1+k)$, with k a function of the number of kids. For a married couple, the size is equal to $(2+k)$. For example, a married couple without children has a size $s = 2$, with one child the size is $s = 2.5$. An unmarried couple is considered as two tax units. If they have children,

they have to divide children and put them in different tax units or put them all in the same tax unit. A married couple with children is considered as a single tax unit. The total amount of tax paid for a tax unit of size s is $s \times g(I/s)$. This fiscal system is called *quotient familial* (family ratio).

When they are not married, the two partners have to fill one tax return each. So they pay

$$g^{(C)}(I) = s_m g(I_m/s_m) + s_f g(I_f/s_f)$$

where I_m (resp. I_f) denotes the male's (resp. female's) income and s_m (resp. s_f) the size of the male tax unit. s_m and s_f depends on how children are split between the two tax returns. When they are married, the two spouses have to fill only one tax return instead of two. They pay two times what someone earning the average income would have paid. Therefore, they pay

$$g^{(M)}(I) = s \times g(\frac{I_m + I_f}{s})$$

Let $f^{(C)}$ (resp. $f^{(M)}$) be the amount of tax paid by an unmarried (resp. married) couple if the tax burden does not exist. Because of the convexity of f, $f^{(C)} \geq f^{(M)}$ (the proof is given by Buffeteau and Echevin (2003)). However, Legendre and Thibault (2007) explain that it could be sometimes more interesting to stay in cohabitation because of the tax relief, which introduces non-linearities in the tax system for low income. So, $f^{(C)} \geq f^{(M)}$ does not necessarily implies $g^{(C)} \geq g^{(M)}$ for low incomes. Therefore, marriage is not tax attractive for all couples. But as a general matter the more different incomes are, the more couples benefit from being married. An interested reader should report to Buffeteau and Echevin (2003), Legendre and Thibault (2007) or Amar and Guérin (2007) for further explanations on that point. A particular fiscal arrangement the year of marriage sharply decreases the amount of tax paid. The decrease is so large that it benefits to all couples, even low income households for whom marriage

is not tax-benefic. So, low income couples benefit from being married the first year of marriage, but not after. The rest of households benefit for marriage, even in the long term, but the benefit is larger the first year of marriage.

The year they marry, the partners have to fill three tax returns, each partner fills his own tax return for the amount of income earned from the 1^{st} of January to the marriage day and they fill a common tax return for the income earned from the marriage day to the 31^{st} of December. If they get married after a period of (t*100)% of the year, they have to pay an amount of tax of :

$$g^{(YM)}(I) = \underbrace{s_m \times g(t * I_m/s_m) + s_f \times g(t * I_f/s_f)}_{=B(t)} + \underbrace{s \times g\Big(\frac{(1-t)(I_m+I_f)}{s}\Big)}_{=A(t)}$$

with $s = (s_m + s_f)$ in most cases. As the rates are not changed when incomes are earned on a few months, the partners can minimize the amount of taxes by choosing the optimal marriage day. Indeed, $B(t)$ is increasing with t while $A(t)$ is decreasing with t. Then, the amount of income taxes to be paid for the year of the wedding depends on the difference of incomes between the partners and on the wedding day. Most of the time, the minimizing date occurs during the second or the third quarter of the year. Figure 2.1 shows examples of the amount of taxes paid by five couples depending on the day they marry. The greater the difference of income between the spouse, the closer the optimal day to the beginning of the 2^{nd} quarter : even if they still pay taxes, the couples for whom one spouse earns 40,000 euros a year and the other one does not work and the couple with incomes 30,000 and 10,000 save more taxes marrying during the second quarter. Lower income households do not pay taxes at all marrying during the third quarter. Using real data, it is possible to compute for each couple which day (or days) is (are) the optimal one(s) for them. Notice that because of

the tax relief for low income, lot of couples could have no tax at all to pay for the year of marriage. They could have the choice between a large number of optimal day. Using the Labor Force Survey of 2005, it is possible to know for each couple of the survey if they are married or not, the number of children they have and the wage each member of the couple earns. I compute for each unmarried couple with at least one employed partner the amount of tax that they would pay if they decide to get married, for each day of the year[6]. I can therefore simulate which day would be the optimal one for each couple, and how much they save compare to a normal married year. First of all, 80% can pay no tax at all for that year choosing the optimal day. Figure 2.2 gives the distribution of the optimal days among the population of unmarried couples, depending on the number of children they have. The figure clearly shows that for most couples, the optimal day occurs during the 2^{nd} or the 3^{rd} quarter. Simulations of paid taxes on the Labor French Survey 2005 in table 2.2 show that 29% of unmarried couples would not benefit from the fiscal arrangement the year the pacs is contracted because they don't pay taxes. But 60% of unmarried couples would saved more than 95% on what they should pay for a normal year. Among them, almost all couples would not pay any taxes at all (the average rate of saved money is 99.9%). Richer couples are not able to pay no tax at all, but they can still largely benefit from the fiscal arrangement.

2.3 The 2005 reform of the pacs

Before 2005, pacsed partners had a different tax system. Especially, they did not benefit from the fiscal arrangements the year of pacs as married couples did. The pacsed partners had to wait for the third year after they contracted their pacs in order to pool incomes and to fill one tax return for the incomes earned during the whole year. And then, they were taxed the same way as married couples. As a consequence,

6. The computation does not take into account *Prime Pour l'Emploi*, a tax credit settled in 2001.

the date of pacs did not have any effect on the amount of tax paid neither the year the pacs was contracted nor three years later, when they pooled their income. Since 2005, pacsed couples have to fill three tax returns for the year of the pacs, exactly as married couples do. The reform reduces significantly the amount of taxes paid for the year of the pacs. If the incomes of partners are significantly different, it leads to reduce the amount paid the two years after the pacs. After, the amount of taxes paid is the same before and after the reform.

Most of the time, couples marry and celebrate their marriage the same day. So, as the partners have many factors to deal with when deciding the date for marriage, it is hard to believe that couples choose the date of the marriage in order to minimize the amount of taxes paid. On the contrary, a pacs is not as celebrated as a marriage. If it is celebrated, the celebration is not organized the day the pacs is contracted because as the pacs is contracted in a court, it is contracted during the week, without any witness (Rault, 2009). Then it is possible to choose the optimal date to contract the pacs and to celebrate it later. As there are not as many factors that could determine the pacs day as for marriage, I believe that couples are able to choose the date in order to minimize the amount of tax paid.

The reform makes the pacs more attractive to couples, because it can lead to pay less taxes the year of the pacs. Moreover, breaking a pacs is easy and costless [7], then the commitment induces by a pacs is not very strong. However, if the pacs is broken during the same year or during the following year, the effect on the income tax is canceled. Notice that when a pacs is broken at least two years after it is contracted, the partners have to fill three tax returns for the income earned the year of the dissolution, one for the couple for the period from 1^{st} of January to the dissolution day and one for each

7. It has changed in 2006. It is still easy to break a pacs but the reform of the pacs of 2006 made the commitment between partners stronger and it gives the partners the right to court his partner for the damages induced by the dissolution.

partner from the dissolution day to the end of the year. A letter is sufficient to break a pacs[8], which makes it easy and fast to break. Then, the partners have the opportunity to pay less taxes the year the pacs is broken by choosing the optimal date.

Thus, under the assumption that if couples answer to the incentive induced by the reform, the answer is optimal, four effects should be observed. First, as the pacs is made more attractive, more pacs should be contracted after 2005. Second, we shoud observe that couples get pacsed during the second or the third quarter. Third, couples should not break their pacs during the same year or during the following year. Fourth, couples who break their pacs may do it during the second or the third quarter.

One should bear in mind that the reform also changed the amount of income taxes paid for the next two years of the pacs year, compared to the amount of income taxes paid by partners that had pacsed before the reform. Three years after the year of the pacs, the income taxation is the same after and before the reform. Therefore, a positive impact of the reform on the number of pacs contracted means that short-term issues are taken into account in the decision to pacs. The last interesting point is that in 2005 nothing changed for the pacs except the income taxation. The legislation of divorce has also changed in 2005, making the divorce easier. It could change the opportunity cost of being pacsed. However, this change is not as important as the unilateral divorce in the US and the impact of unilateral divorce on marriage rates is not clear (??Lee and Solon, 2011). If any, the impact of an easier divorce of marriage rates is not immediate (?). Moreover, I estimate the impact of the reform of the pacs on the change in the seasonality of the pacs. It is not clear that the change is the divorce law would change the seasonality of the pacs. Therefore, this is unlikely to bias my results.

8. A letter is sufficient if both the partners agree on the dissolution. If only one partner wants to dissolve a pacs, he has to send a letter through a lawyer.

3 Data and preliminary evidences

3.1 Available Data

A pacs is not contracted at the town hall as marriages but at the closest court from the place where at least one partner lives. Then, data belong to the Ministry of Justice. Micro data have been highly protected until 2004. The legislator feared for homophobia and violence towards pacsed people. Therefore, they decided to protect couples by registering pacsed couples on a secret file that was not available, even for statisticians from the Ministry of Justice and by preventing national surveys from asking couples if they were pacsed or not. Therefore, the main surveys in France, such as the Labor Force Survey, do not include any information about pacs. Because of the growing number of pacs, the protection disappeared in 2005 but micro data are still not available, except for statisticians from the Ministry of Justice. That is why some descriptive figures on pacsed couples are available thanks to **?**. But, only aggregated data are available, which make it impossible to have access to crucial information, such as the incomes of the partners.

As a consequence, all the information we have is the number of pacs contracted and broken up in each court, for each quarter. There are 462 courts in France (20 in Paris, so it makes 443 when Paris is aggregated). Then I consider 10 years, i.e. 40 quarters. Therefore I have 18480 observations (17720 when Paris is aggregated).

Controls are constructed using census data, at the town level. Towns are then gathered into courts. Therefore, the geographical unit is the smallest unit on which the pacs rate can be computed.

3.2 Demographic trends

Three mains demographic trends are interesting. The marriage rate decreased since 1980, except for some short period of time. Since it was created in 1999, the number of pacs contracted by year increased a lot leading to an increasing overall union rate.

The number of pacs contracted has increased a lot since it was created (see table 2.3). 22,108 pacs were contracted in 2000, the first complete year of the pacs, and 172,104 were contracted in 2009. In 2000, approximately 284,000 marriages were celebrated, and 254,000 in 2009. Therefore, the total number of unions increased in France over the last decade.

However, the proportion of pacs couples in the population remains small, because it is still a recent form of union. The fiscal statistics[9] indicates that in 2009, over 100 persons filling their fiscal form, 1.6 is filled by a pacsed person, 50.8 by a married couple, 29.4 by a single, 10.1 by divorced individual and 8.1 by a widow.

The increase in the number of pacs and the decrease in the number of marriage is wide spread in France. As table 2.3 shows, the pacs rate per 1000 persons aged 15-59 years old has increased in all courts : the mean pacs rate has increased from 0.5 in 2000 (with a standard deviation of 0.22) to 3.4 in 2008 (with a standard deviation of 0.89).

Figure 2.5 illustrates the decrease of the marriage rate and the increase of the overall number of unions. The marriage rate for 1000 persons aged 15-59 decreased in all courts : it was 10.0 (sd of 2.70) in 1980 and it is 6.2 (sd 0.81) in 2009. The decrease of the marriage rate is mostly explained by a huge decrease in the marriage rate for thousand 15-29 persons (the male age is taken as a reference for the age of the

9. Déclarations Nationales d'Impôt sur le Revenu,
http://www2.impots.gouv.fr/documentation/statistiques/2042_nat/Impot_sur_le_revenu.htm

couple) from 20.8 in 1981 to 7.2 in 2009. It was not compensated by the increase in the marriage rate for 1000 persons aged 30 to 44 years old from 5.0 in 1981 to 9.0 in 2009 nor by the increase in the marriage rate for 1000 persons aged 45 to 59 years old from 1.2 in 1981 to 2.9 in 2008. The marriage rate is still higher than the pacs rate, although they tend to be closer. Defining unions as the sum of pacs and marriages contracted in each court, the union rate per 1000 persons aged 15 to 59 years old in 2009 is greater to what it was in 1981 : it was equal to 10.0 in 1981, it is equal to 10.3 in 2009 but it was equal to 7.5 when the pacs was created in 1999.

As expected, the seasonality of the pacs series changed after the reform. Figure 2.3 shows that the pacs rate increased for each quarter, but the seasonality was completely reversed after the reform. The number of pacs contracted during the first quarter decreased right after the reform. This could be explained by a schedule impact : some couples decided to contract a pacs but instead of doing it immediately they wait for three (or more) months in order to benefit from the newly attractive tax system.

Dissolution rates follow another pattern. The dissolution rate is computed as the number of dissolution per 1000 pacsed couples. Table 2.4 shows that after a large increase during the first years the dissolution rate tended to become stable. But this evolution is difficult to interpret. Indeed, the large increase in the pacs rate changes the population of pacsed couples over the time. Therefore, the proportion of newly pacsed couples tends to increase, making difficult the interpretation of the stability of the pacs rate. Nevertheless, if couples change their separation behavior for fiscal reasons, the seasonality of pacs should change after the reform. Therefore, I will not comment much on the level of dissolution but on the seasonality of separation.

4 The estimation strategy

4.1 Limits of a difference in difference model

The identification strategy takes advantage of the taxation system. Indeed, the way the *quotient familial* is implemented introduces a distinction between two parts of the year : the attractive part and the unattractive part for taxation matters. The attractive part is composed of the 2nd and the 3rd quarters (spring and summer) and the unattractive part is composed of the 1st and the 4th quarter (autumn and winter).

The identification strategy lies on the idea that couples getting pacsed because of the reform are going to contract their pacs during the attractive part of the year. The estimation of the total impact of the reform is easily obtained by a difference-in-difference estimation strategy using the quarters of the unattractive part of the year as a control group and the quarters of the attractive part of the year as a treated group. This estimation gives the impact of the reform under two main assumptions :

(a) the number of pacs contracted during the unattractive part of the year is unaffected by the reform.

(b) The common trend assumption, that states that without the reform, the number of pacs contracted during the attractive part of the year would have evolved the same way as the number of pacs contracted during the unattractive part of the year.

If the two assumptions are verified, comparing the evolution of the number of pacs contracted during the attractive part of the year to the evolution of the number of pacs contracted during the unattractive part of the year gives the total impact of the reform.

These two main assumptions could be unverified for two main reasons. First, remember that the reform modified the income taxation for the three years following the pacs, even if the first year is the most modified. So, the unattractive part of the year

could be also affected because couples contracting a pacs during this part of the year see the taxes they pay modified during the first three years following the pacs. So the number of pacs contracted could increase during both part of the year. As a consequence, if the unattractive part of the year is also affected by an increase in pacsed couples because of the reform, this increase is going to be interpreted as the year effect, so the difference in difference estimation is biased and it is going to underestimate the true impact of the reform, because it takes as a baseline the number of pacs contracted during the unattractive part of the year, which boosted by the reform. However, as it is much more profitable to contract a pacs during the attractive part of the year, it is likely that couples getting pacsed for fiscal reasons are going to contract their pacs during the attractive part of the year, so it is highly believable that the number of pacs contracted during the unattractive part of the year is unaffected by the reform even if couples contracting their pacs during this part of the year are affected by the reform.

Moreover, the difference-in-differences method only gives the total impact of the reform, which is composed of two effects. First, the reform could have a direct and positive impact on the number of pacs contracted. Second, the reform could have an indirect impact : couples that would have contracted a pacs anyway are now more likely to do so during the attractive part of the year. Let's call this impact the "schedule impact". In that case, the number of pacs contracted during the unattractive part of the year is lower than what it would have been if the schedule impact was null. In other words, the unattractive part of the year suffers from negative externalities from the other part of the year and the stable unit treatment value assumption defined by Angrist, Imbens, and Rubin (1996) does not hold. Therefore, the difference in difference estimator estimates the total impact of the reform, including the schedule impact. It is not possible to disentangle the direct impact of the reform from the schedule impact of the reform unless one assumption is added.

To illustrate the problem of externalities, let y_{iqT} be the rate of pacs contracted in the court i, during the quarter q of the year T. Years are recoded in order to begin with the 4th quarter and to end with the 3rd quarter. The recoding makes sense because :

(a) the pacs was created in the 4th quarter 1999

(b) the reform was announced just before the beginning of the fourth quarter 2004. As, it was an unexpected reform, couples were not able to delay their pacs in order to benefit from the reform before the 4^{th} quarter of 2004.

y_{iqT} is written as :

$$y_{iqT} = \alpha_0 + \alpha_T + \alpha_{iq} + \delta_{qT} + u_{iqT}$$

where α_T is the year fixed-effect, α_{iq} is a combined fixed effect for courts and quarters and δ_{qT} are a combined fixed effect of year and quarters. The impact of the reform on the pacs rate is given by the evolution of the δ_{qT}s. The δs are composed of the direct and the schedule impact. On the one hand, let β_T give the direct impact of the reform : the pacs rate increases with β_T during the attractive part of the year in year T. On the other hand, let γ_T represent the schedule impact : it increases the pacs rate during the attractive part and decreases the pacs rate during the unattractive part of the year. The attractive part of the year is divided into two quarters : let p_{1T} (resp. p_{2T}) be the part of the direct impact β_T (resp. schedule impact γ_T) of the reform contracted during the 2^{nd} quarter. The unattractive part is also divided into two quarters : let p_{0T} be the proportion of couples delaying their pacs that would have contracted their pacs during the 1^{st} quarter. Therefore, the δ_{qT} are :

$$\delta_{qT} = \begin{cases} -p_{0T}\gamma_T, & \text{if q=1} \\ p_{1T}\beta_T + p_{2T}\gamma_T, & \text{if q=2} \\ (1-p_{1T})\beta_T + (1-p_{2T})\gamma_T, & \text{if q=3} \\ -(1-p_{0T})\gamma_T, & \text{if q=4} \end{cases}$$

The δ_{qT} represents 5 parameters and there are only 4 equations. There are clearly too much parameters and the estimation of such a model is infeasible.

As we are interested in the β_Ts, the γ_Ts and the α_Ts, the pacs rate can be written as y_{isT} where s indicates the semester. $s = 1$ for the unattractive part of the year and $s = 2$ for the attractive part of the year. $y_{iT,s=1} = y_{iT,q=1} + y_{iT,q=4}$ is the pacs rate for the unattractive part of the year and $y_{iT,s=2} = y_{iT,q=2} + y_{iT,q=3}$ is the pacs rate for the attractive part of the year.

$$y_{isT} = 2\alpha_0 + 2\alpha_T + \alpha_{is} + \delta_{sT} + u_{isT} \tag{4.1}$$

where

$$\delta_{sT} = \begin{cases} -\gamma_T, & \text{if s=1 ;} \\ \beta_T + \gamma_T, & \text{if s=2 ;} \end{cases}$$

A difference-in-difference estimation would give an estimation of $\alpha_T - \gamma_T$ as the year effect and $\beta_T + 2\gamma_T$ as the impact of the reform. Therefore, if $\gamma_T > 0$, it tends to underestimate the year fixed effect and to overestimate the incentive impact of the reform.

4.2 The estimated model

The usual way to get rid off externalities consists in using two control groups and to compute a difference in difference in difference (DDD) estimator. One control group (C1) is affected by the reform and loose γ_T pacs, but the other (C2) is not affected. The treated group (T) receive the direct impact of the reform and the delaying pacs ($\beta_T + \gamma_T$ pacs). Comparing T and C2 identifies $\beta_T + \gamma_T$, comparing C2 and C1 identifies

γ_T and the comparison of the differences identifies β_T.

Unfortunately, I cannot distinguish two control groups in the pacs case, but the DDD estimator could be extended in the case in which there are two controls group that are not affected with the same intensity by the reform. Taking advantage of the variation between the control groups does not permit a point identification of the incentive impact of the reform, but it gives bounds for to the incentive impact of the reform.

I consider two control groups : the fourth and the first quarter of the year. Both quarters are untreated, because they are part of the unattractive part of the year. Yet, both of them can suffer from negative externalities : some couples are likely to delay their pacs to wait for a more attractive part of the year to contract their pacs. But both quarters are not likely to be affected the same way : if couples have a preference for the present large enough, it might be more difficult to delay a pacs from the fourth quarter to the next spring/summer than from the first quarter to the next spring.

In order to disentangle the direct impact of the reform from the schedule impact, I recode the time windows q in a variable t such as, $t = 0$ for the fourth quarter, $t = 1$ for the first one and $t = 2$ for the sum of the second and the third quarters. Then :

$$y_{itT} = \alpha_0 + \alpha_T + \alpha_{it} + \delta_{tT} + u_{itT} \tag{4.2}$$

with

$$\delta_{tT} = \begin{cases} -(1 - p_T)\gamma_T, & \text{if t=0 ;} \\ -p_T\gamma_T, & \text{if t=1 ;} \\ \alpha_0 + \alpha_T + \beta_T + \gamma_T, & \text{if t=2 ;} \end{cases}$$

p_T is the proportion of delaying pacs that would have been contracted during the first quarter if not delayed, have they not delay their pacs. The closer p_T from $1/2$, the more similar the two controls group are. The extreme case, $p_T = 1/2$ prevents

from identifying γ_T, because the difference between the two controls group is 0. On the contrary, $p_T = 1$ and $p_T = 0$ corresponds to the DDD estimator.

The difference in difference method gives an estimation of the β_Ts, the γ_Ts and the α_Ts that depends on the value of p_T. Indeed, the estimated equation is :

$$y_{itT} = \alpha_0 + \alpha_{it} + a_{0T} + a_{1T} + a_{2T} + u_{itT} \tag{4.3}$$

with the α_{iT}s are court crossed with period of the year fixed effect, the a_{0T}s are year fixed effects, the a_{1T}s (resp. the a_{2T}s) are year fixed effects crossed with a dummy for $t = 1$ (resp. $t = 2$) and

$$\begin{cases} a_{0T} &= \alpha_T - (1 - p_T)\gamma_T \\ a_{1T} &= (1 - 2p_T)\gamma_T \\ a_{2T} &= \alpha_T + \beta_T + (2 - p_T)\gamma_T \end{cases}$$

The a_{kT} are statistical parameters, used to estimate the interpretable parameters α_T, β_T and γ_T. Then, for a given p :

$$\begin{cases} \alpha_T(p_T) &= a_{0T} + \frac{1-p_T}{1-2p_T} a_{1T} \\ \gamma_T(p_T) &= \frac{1}{1-2p_T} a_{1T} \\ \beta_T(p_T) &= a_{2T} - a_{0T} - (1 + \frac{2}{1-2p_T}) a_{1T} \end{cases}$$

Therefore, the identification of the bounds requires some conditions on the parameters : if $a_{1T} < 0$ and $a_{2T} - a_{0T} + a_{1T} \geq 0 \; \forall T \geq 0$ or if $a_{1T} > 0$ and $a_{2T} - a_{0T} - 3a_{1T} \geq 0$ $\forall T \geq 0$ then it is possible to identify an upper and a lower bounds to the β_T and the γ_T (see the proof in section 8.1.2 in the appendix). These conditions are easily verified in the data. The estimation of informative bounds requires two assumptions. The first assumption simply states that $\beta_T \geq 0$ and $\gamma_T \geq 0, \forall T \geq T_0$. This assumption is not very strong as it stipulates that the reform has been indeed incentive and it did not discourage couples to contract the pacs during the attractive part of the year.

Moreover, it indicates that delaying pacs are going from the unattractive part of the year to the attractive part of the year. This assumption is likely to be unverified if some couples prefer to wait for the unattractive part of the year to signal that their pacs is not a tax induced pacs. It is also unverified if the reform implied an important increase in the number of pacs, leading to overburden courts and a crowing out effect. Although this story can not be rejected, it is very unlikely to affect the courts the first year after the reform. Indeed, the impact of the reform, albeit strong, is not likely to be strong enough to induce a large crowding out effect. After some years, the court may adjust their labor force to take this increase into account. The second required assumption is that p, the proportion of delaying couples that would have pacs during the first semester is constant over time. A change in this proportion could be justified by a relative change of the composition of couples willing to get pacsed during the fourth quarter compared to couples willing to get pacsed during the first quarter. As the reform of taxation is the only reform of the pacs that might change the seasonal composition of pacsed population, this assumption is not very strong.

In order to define the bounds, I fix a p^*, which is the only p such as $\gamma_T(p) \geq 0$ and $\beta_T(p) \geq 0$, for all T and $p \geq p^*$. If $p \in]1/2, +\infty[$, the bounds are given by :

$$\begin{cases} \alpha_T(p) \in [\alpha_T(1); \alpha_T(p^*)] \\ \gamma_T(p) \in [\gamma_T(1); \gamma_T(p^*)] \\ \beta_T(p) \in [\beta_T(p^*); \beta_T(1)] \end{cases}$$

5 The results

5.1 Effect on the pacs rate

All estimations presented above are based on difference in difference estimation. Therefore, the standard errors might be biased downward in case of autocorrelation of the error terms, as explained in Bertrand, Duflo, and Mullainathan (2004). As a consequence, all standard errors are clustered at the court level.

The explained variable is the pacs rate for 1000 persons aged 15-59. Although the age of pacsed spouses is unknown, I assume that most pacs are contracted by partners less than 60 years old. This assumption seems reasonable since (a) Carrasco (2007) showed that pacsed couples are similar to couples getting married for the first time and (b) only 2.3% in 2000 and 4.7% in 2009 of marriages were contracted by partners aged more than 60. This rate seems more intuitive than the classic raw rate for 1000 persons.

First I estimate the difference in difference model, given by the equation 4.1. Results are given by the table 2.5. Column (1) and (2) give results without introducing fixed effect. The introduction of controls variables does not change the point estimate of year effects and year$\times$ sem.2 fixed effects, but the point estimate of the constant. It means that adding controls does not necessarily improve the estimation because these controls don't add any relevant information. My favorite estimation is given in column (3). It introduces some court $\times$ sem.2 fixed effects. The impact of the reform is given by the evolution of the year$\times$sem.2 fixed effects. Before 2005, the point estimates for the coefficients for year$\times$sem.2 variables are very low, although they are significant for early years. It means that the second semesters in 2001 and 2002 could have been slightly different from the second semester in 2000. But the main evolution occurs after 2005 : after 2005, the coefficients start increasing a lot. It reveals a systematic change in the seasonality right after the reform of the pacs. However, as explained in

the previous section, this estimation can result from both the incentive effect of the pacs and from the delaying effect of the pacs.

Then, I estimate the model described by equation 4.3 in order to define bounds for the impact of the reform. As a robustness check, I construct another explained variable : the pacs rate for 1000 couples. However, this variable is likely to have high measurement errors because couples are not well measured in France. Indeed, until the last census, people were not asked if they were single or not. Therefore, the number of couples was approximated by the number of married couples before 2006. For each explained variables, I also test the robustness of the results using different specifications : including crossed court-period of the year fixed effects compared to period of the year fixed effects or including time varying variables as controls regarding the socio-economic environment, although these controls have not been found having a good explanatory power for the difference in difference estimation.

Results of the regression for the number of pacs contracted are given by the tables 2.6 and 2.7. The parameters are not interesting *per se* even if they are directly interpretable. They are interesting as they permits verifying if the necessary conditions are verified or not. My results are robust across specifications using both pacs rates. So I construct the results of the estimation of the structural parameters only for the full specification, i.e. the pacs rate per 15-59 years old persons, including controls and court crossed with period of the year fixed effects.

For each specification, the last column indicates if the required conditions $a_{1T} < 0$ and $a_{2T} - a_{0T} + a_{1T} > 0, \forall T \geq T_0$ are verified (as I suspect $p > 1/2$). Here, they are clearly verified for all year after the reform. Therefore, it is possible to find a p such as $1 \geq p > 1/2$, in order to construct the upper and lower bounds to the direct and the schedule impacts of the reform. The $p^* = 0.853$ is the lowest p such as $\gamma_T(p) > 0$ and $\beta_T(p) > 0$ for all years after the reform. The structural parameters $\alpha_T(p) > 0$,

$\gamma_T(p) > 0$ and $\beta_T(p) > 0$ are estimated using the system 8.1.2.

The estimated upper and lower bounds of the reform are given in table 2.10 and plotted in figures 2.8. The direct impact of the reform increased over time : it is very close to zero in 2005, but it raised with 0.23-0.33 points the average pacs rate per 15-59 persons in a court in 2006. In 2009, fiscal incentive resulted in an increase with 0.65-0.85 points in the pacs rate. The schedule impact of the reform stayed constant after the reform. The pacs rate during the unattractive part of the year decreased with 0.16-0.23 point each year, leading to an increase with 0.16-0.23 point each year during the attractive part of the year. This two effects comes in addition to the natural increase in the pacs rate. The average pacs rate remained stable during the first two years compare to the average pacs rate in 2000. It increased with 0.04 points in 2003, until 0.69-0.73 in 2009.

Table 2.11 presents the proportion of the pacs rate that can be attributed to the reform. The direct impact of the reform increased the average pacs rate by 13%-20% in 2006 until 16%-21% in 2009. The schedule impacts represents around 7%-10% of the pacs rate in 2006 and 6%-8% in 2009.

The counterfactual of the average pacs rate without the reform is given by figures 2.9. The figures clearly show that the pacs rate would have been lower without the reform, but it would have increased anyway. Therefore, fiscal incentives only explain part of the total increase of pacs rates in France. The overall increase of the pacs rate would have been more equally distributed over quarters without fiscal incentives.

5.2 Effects on dissolutions

As the pacs is quite easy to break, couples could adjust their decision to break up their pacs to the tax system in order to benefit from its effects the year they break up.

There are four different ways to break up a pacs. First, if partners agree on the

dissolution, they can send a letter to the court to break up the pacs. This is a mutual consent breaking. Second, if partners do not agree, a pacs can be unilaterally broken up : the leaving partner has to write a letter to the court and to the other partner through a lawyer to announce its decision. Third, a pacs is automatically broken when the couple get married in which case partners do not have to send any letter to the court. Fourth, the pacs is automatically broken if one of the partners dies. As for the marriage, the surviving partner does not need to write a letter to the court. In all cases but marriage, partners benefit from the three tax returns system. As death is not a choice, I only study breaking reasons that imply that partners fill three tax returns.

A simple letter is sufficient to break up a pacs : the schedule could be manipulated by couples. I study the impact of the reform on dissolution rates using the same framework as the contracted pacs rate. Indeed, the expected impacts of the reform, if any, should be similar. As for the year the pacs is contracted, couples face the same tax system (but inverted) the year the pacs is broken up. The couple has to fill three tax returns : they pool their incomes for the first part of the year until the day the pacs is broken and they have to fill two tax return for the part of the year after the pacs is broken. Therefore, they could benefit from the same attractive taxation. If couples are sensitive to that incentive, two impacts are expected : (1) an increase in the number of broken pacs, (2) more pacs should be broken during the attractive part of the year, resulting from an incentive effect and a schedule effect. As for the contracted pacs, bounds of the direct and the schedule effect could be identified if the conditions $a_{1T} < 0$ and $a_{2T} - a_{0T} + a_{1T} > 0, \forall T \geq T_0$ or $a_{1T} > 0$ and $a_{2T} - a_{0T} - 3a_{1T} > 0, \forall T \geq T_0$ are verified.

An increase in the number of dissolutions could be observed right after the reform, because the tax system gives an incentive to break up the pacs to all pacsed couples. But the increase should be more accurate after 2007. The increase in the number of pacs because of the direct impact of the reform on contracted pacs could change the

composition of pacsed couples. Especially, couples sensitive to taxation are now pacsed and they could also be sensitive to incentives to break up their pacs. But they have to remain pacsed the year following their pacs to benefit from the attractive tax system. So if they decide to break up their pacs for tax benefit, they should do it two years later. Therefore, an increase of the dissolution rate could be observe after 2007.

I consider two definitions of dissolution rates : (1) the number of dissolution for 1000 pacs (contracted at least 6 months before), (2) the number of dissolution for 1000 persons aged 15-59 years old. However, none of them is easily interpretable. The number of dissolutions for 1000 pacs takes into account the at-risk population, i.e. the pacsed couples. However, the large increase in the pacs rate, especially after 2005, change the composition of the pacsed population. It makes the ratio difficult to interpret as it considers all pacs as similarly affected by the risk of separation. Moreover, the seasonality increase the number of pacs differently over the year, adding couples unlikely to break up. The ratio is computed for 1000 pacs contracted at least 6 months before in order to take into account population more likely to break up. The number of dissolution for 1000 persons aged 15-59 years old does not take into account the at-risk population. It just rescales the number of population to take into account differences in the size of the courts.

The difference in difference estimation is given in table 2.8. For clarity reasons, I only show results without controls as controls do not affect the results. Considering the rate of broken pacs for 1000 persons, the affected semester tends to be always different from the unaffected semester. This is no longer the case when considering the rate of broken pacs for 1000 pacs, especially when court$\times$sem. fixed effects are added (column (4)). It shows that the rate of broken pacs is unaffected by the reform. The rate of dissolution for 1000 pacs seems affected by the reform when court$\times$sem. fixed effects are not added. Excluding court$\times$sem. increases the point estimate which could explain that it becomes significant. The rate of broken pacs for 1000 persons

shows that the second semester has always been different from the first, but the point estimate increases suddenly in 2005 from 0.0167 to 0.333. Surprisingly, it decreases in 2007 from 0.0323 to 0.0253. This change could be attributed to a change in the composition of the population of pacsed partners after 2005. As this impact could be attributed to couples delaying the day they break up the pacs or to the incentive impact of the reform, I estimate the model given in 4.3, in order to identify bounds to both effects.

The results of the estimation are given by the table 2.9. The results are more difficult to interpret than results on the contracted pacs because the sign of a_{1T} is not constant after the reform. It means that couples were less likely to break up their pacs during the first quarter than during the fourth quarter from 2005 to 2007, and this is reversed in 2008 and 2009. The coefficients a_{1T} are not (or slightly) significant from 2007 to 2009. It denotes that the first and the fourth quarter are not statistically different. As the identification of bounds requires some variations between the two quarters, it is not possible to identify bounds on the two potential effects of the reform in the case of broken pacs.

The difference in difference estimation tends to show that if any, the impact of taxation on the decision to break up a pacs is small. The second estimation shows that it is not possible to disentangle the incentive impact from the schedule impact of the reform on broken pacs.

6 Interpretation

The different evolutions of the distinct effects of the reform can be explained by information issues. During its first years, the pacs was still a new contract and it was thought same-sex couples targeted. The pacs rate did not increase much because couples were not aware that it was an interesting form of registered partnership. But

as couples acquired information about the contract, the pacs rate started to grow naturally. When the reform was settled in 2005, most couples did not know that the pacs became more attractive in terms of taxation. Therefore, they did not answer the incentive right after the reform. But information relative to taxation of pacsed couples spread out after the reform, explaining why more couples want to benefit from it as time goes by. In the same time, couples that decide to contract a pacs for reasons distinct from taxation acquired information about the pacs. Then they could react directly to the incentive. This kind of couples is a stable part of the population, explaining why the schedule impact of the reform did not increase over time.

The attractive tax system for broken couples after the reform did not increase the dissolution rates and couples did not adjust the schedule of dissolution to benefit from it. Was this result unexpected ? Not really, given that the benefit from the tax system is evaluated as the couple level. But at the spouse level it is not necessarily attractive, unless spouses transfer income to each other. Contracting/breaking up a pacs is attractive when spouses pool their income or at least if they can easily transfer income from the richer to the poorer one. Getting pacs is part of the construction of the couple : so they can easily pool their income. But breaking a pacs in order to benefit from the tax system require some *ex post* transfers that are less easily done by a breaking couple. Couples do not take advantage of the tax incentive the year they break up : it tends to show that couples do not do *ex post* transfers. So, even if this would be benefic at the couple level, they do not pool their income once they decide to break up their pacs. Of course, this system could be used as tax evasion means[10].

10. This possibility was raised by the deputy Charles de Courson since the pacs was created. In 2010, the tax system has been amended. During the debate, he said "When we were talking about the creation of the pacs, I raised the problem saying that I would write in the classifies in *Le Nouvel Obs* : 'Single looks for female student without income to contract a six months pacs in order to share fiscal benefit'. Because the mecanism allows to pacs every January 1^{st} and to unpacs every July 1^{st}. This risk of embezzlement of this civil goal led to the adoption of an amendment imposing a minimal duration of 3 years before having the fiscal benefit. But alas, our majority [UMP - right party, majority in France since 2002] got rid off this clause contrary to my opinion. Now we witness the beginning of the embezzlement of the law." - From debates on "Projet de loi de finances pour 2011 : Articles

In that case, fake couples could contract a pacs and break up the pacs every other year in order to optimize the tax they have to pay. We provide suggestive evidence that if this kind of behavior exists, it is too marginal to be observed in the data.

7 Conclusion

A costs/benefits analysis of marital behavior predicts that an attractive taxation of married couples should increase marriage rates. Although taxation is not marriage-neutral in many countries, taxation has not been found to have a clear and significant impact on marriage rates. In some Western Europe countries, couples can either get married or contract an other form of marital contract. In France, this contract is called pacs. I show that taxation does impact the decision to contract a pacs in France and that 16-20% of pacs contracted in 2009 can be attributed to an attractive tax system.

The identification strategy relies on a difference in difference method. The tax system changed for pacsed partners in 2005. Before 2005, the date the pacs was contracted did not change the amount of income taxation paid for that year. After 2005, the date of the pacs impacts the amount of tax paid. It is now more attractive to contract a pacs, especially if it is contracted during the attractive part of the year. I distinguish two types of reaction to the reform : the incentive impact (couples getting pacsed because of the tax incentive) and the schedule impact (couples that would have contracted a pacs without the reform but change the day they contract it in order to benefit from the tax system). I show that the schedule impact stays stable and represents 0.15-0.30 points of the average pacs rate in the courts. The incentive impacts was very small right after the reform, but it increased over time and it represents 0.65-0.85 points of the average pacs rates (i.e. 16-20% of the total mean pacs rate) in 2009. I do not find any impact of income taxation on the decision to

de la deuxième partie"

break up the pacs.

The paper shows that although marriage behaviors are not closely related to tax incentive, pacs behaviors are sensitive to attractive taxation. However, the relationship between pacs and tax is not as close to what politics feared. Indeed, deputies feared that pacs could favor tax evasion. I show that there is no evidence that the dissolution of pacs has been favored by the tax system. The tax system the year of the pacs/marriage has been changed in 2010 (starting in 2011) : since 2011, couples do not benefit from the tax system presented in the paper. There were several reasons invoked to justify the reform, among which the idea that pacs favored tax evasion.

The paper questions the link between pacs and marriage : why are these couples getting pacsed rather than married ? It tends to show that the reason explaining a pacs can be different from the reason explaining a marriage. The lack of microdata prevents from studying carefully the link between marriage and civil union. This is left for further research, as soon as better data are available.

8 Annexes

TABLE 2.1: Legal features of marital status in France

	Cohabitation	**Pacs**	**Marriage**
Income taxation	Separate	– Before 2005 : separate during 3 years, common after – After 2005 : common since the day the pacs is contracted	Common since the day the marriage is contracted
Inheritance	– Surviving partner has to be declared in the testimony – High tax rates : after a 1564eur allowance, tax rate of 60%	– Surviving partner has to be declared in the testimony – Since 2007 : No tax – Before 2007 : marginal tax rate of 40% until 15000eur, 50% after	– Surviving partner automatically inherits from the spouse – Since 2007 : No tax – Before 2007 : Taxed, but lower rates than pacsed partners
Assets sharing	No asset sharing, unless bought together	– Since 2006 : By default, the contract separates assets. But the type of contracts can be changed. – Before 2006 : Depends on the contract when the pacs is contracted.	By default, the contract separate assets bought before the marriage, but assets bought after the marriage are common (communauté de biens réduite aux acquêts). But the type of contracts can be changed (for separate or community of all assets.
Debts	No solidarity	Solidarity of debts linked to everyday life and housing	Solidarity of debts (but protection of the housing)
Adoption	No legal adoption by the partners (but one can adopt on its own)	No legal adoption by the partners (but one can adopt on its own)	Legal adoption authorized
Social protection	No common coverage	Common coverage allowed	Common coverage allowed
Survivor's pension	No	No	Yes
Citizenship	No citizenship	No citizenship, but being pacsed can be a relevant piece	Citizenship after 4 years
Break up	Unilateral or common. No cost, but no alimony nor damages pension	Unilateral or common. No great costs : letter to the court. But no alimony, possibility of damages pension	Common. Divorce costs (obligation to be dissolved by a judge). Possibility of alimonies and damages pension

Legal features at the end of 2009

8.1 Identification strategy

8.1.1 Link between the parameters from the structural equation and the reduced form equation

$$y_{itT} = \alpha_0 + \alpha_T + \alpha_{it} + \delta_{tT} + u_{itT} \tag{8.1}$$

with

$$\delta_{tT} = \begin{cases} -(1-p)\gamma_T, & \text{if t=0 ;} \\ -p\gamma_T, & \text{if t=1 ;} \\ \alpha_0 + \alpha_T + \beta_T + \gamma_T, & \text{if t=2 ;} \end{cases}$$

Then

$$\begin{aligned} y_{itT} &= \alpha_0 + \alpha_T + \alpha_{it} - (1-p)\gamma_T \mathbb{1}\{t=0\} - p\gamma_T \mathbb{1}\{t=1\} \\ &+ (\alpha_0 + \alpha_T + \beta_T + \gamma_T)\mathbb{1}\{t=2\} + u_{itT} \\ &= \alpha_0 + \alpha_{it} + \underbrace{[\alpha_T - (1-p)\gamma_T]}_{a_{0T}} + \underbrace{[(1-2p)\gamma_T]\mathbb{1}\{t=1\}}_{a_{1T}} \\ &+ \underbrace{\alpha_0 \mathbb{1}\{t=2\}}_{\text{in the fixed effect}} + \underbrace{[\alpha_T + \beta_T + (2-p)\gamma_T]\mathbb{1}\{t=2\}}_{a_{2T}} + u_{itT} \\ &= \alpha_0 + \alpha_{it} + a_{0T} + a_{1T} + a_{2T} + u_{itT} \end{aligned}$$

8.1.2 Upper and lower bounds of $\alpha_T(p)$, $\gamma_T(p)$ and $\beta_T(p)$

Let α_T, γ_T and β_T be functions of p_T such as :

$$\begin{cases} \alpha_T(p_T) &= a_{0T} + \frac{1-p_T}{1-2p_T} a_{1T} \\ \gamma_T(p_T) &= \frac{1}{1-2p_T} a_{1T} \\ \beta_T(p_T) &= a_{2T} - a_{0T} - (1 + \frac{2}{1-2p_T}) a_{1T} \end{cases}$$

α_T, γ_T and β_T are monotonous functions of p_T. In particular, the derivative of γ_T

is of the same sign as a_{1T} and the derivative of β_T is of the opposite sign as a_{1T}.

Moreover :

$$\begin{cases} \gamma_T(0) = a_{1T} \\ \gamma_T(1) = -a_{1T} \\ \lim_{p_T \to 1/2^-} \gamma_T(p_T) = sgn(a_{1T})\infty \\ \lim_{p_T \to 1/2^+} \gamma_T(p_T) = -sgn(a_{1T})\infty \end{cases}$$

Therefore, γ_T has the same sign on $]-\infty; 1/2[$ and the opposite sign on $]1/2; +\infty[$. As a consequence, γ_T is always positive either on $]-\infty; 1/2[$ or on $]1/2; +\infty[$, depending on the sign of a_{1T}.

Similarly :

$$\begin{cases} \beta_T(0) = a_{2T} - a_{0T} - 3a_{1T} \\ \beta_T(1) = a_{2T} - a_{0T} + a_{1T} \\ \lim_{p \to 1/2^-} \beta_T(p_T) = -sgn(a_{1T})\infty \\ \lim_{p \to 1/2^+} \gamma_T(p_T) = sgn(a_{1T})\infty \end{cases}$$

If $a_{1T} > 0$, $\beta_T(p_T) \geq 0$:

– $\forall p_T \in [0, \underline{p}] \cup]1/2, +\infty[$ if $a_{2T} - a_{0T} - 3a_{1T} \geq 0$

– $\forall p_T \in]1/2, \overline{p}[$ if $a_{2T} - a_{0T} + a_{1T} \geq 0$

If $a_{1T} < 0$, $\beta_T(p_T) \geq 0$:

– $\forall p_T \in]-\infty, 1/2[\cup [\overline{p}, 1]$ if $a_{2T} - a_{0T} + a_{1T} \geq 0$

– $\forall p_T \in]\underline{p}, 1/2[$ if $a_{2T} - a_{0T} - 3a_{1T} \geq 0$

As a consequence, the conditions $\beta_T(p_T) \geq 0$ and $\gamma_T(p_T) \geq 0$ are jointly verified :

1. if $a_{1T} > 0$ and $a_{2T} - a_{0T} - 3a_{1T} \geq 0$: $\beta_T(p_T) \geq 0$ and $\gamma_T(p_T) \geq 0$ $\forall p_T \in [0, \overline{p_T}]$, with $\beta_T(\underline{p}) = 0$.
2. if $a_{1T} < 0$ and $a_{2T} - a_{0T} + a_{1T} \geq 0$: $\beta_T(p_T) \geq 0$ and $\gamma_T(p_T) \geq 0$ $\forall p_T \in [\underline{p_T}, 1]$, with $\beta_T(\overline{p}) = 0$.

Depending on the sign of a_{1T}, the sets $[0, \overline{p}]$ and $[\underline{p}, 1]$ define lower and upper bounds to α_T, β_T and γ_T.

However, by construction, the lower bound for β_T is always zero and is not informative. But if the sign of a_{1T} remains constant and the conditions are verified for all T then it is possible to define a unique p^* such as $\beta_T(p^*) \geq 0$ and $\gamma_T(p^*) \geq 0$. If $a_{1T} > 0$, $p^* = min\{\overline{p_T}; T \geq T_0\}$ and if $a_{1T} < 0$, $p^* = max\{\overline{p_T}; T \geq T_0\}$.

To sum up, the important conditions for the identification of bounds to β_T and to γ_T are :

– either $a_{1T} > 0$ and $a_{2T} - a_{0T} - 3a_{1T} \geq 0 \; \forall T \geq 0 \Rightarrow p^* = min\{\overline{p_T}; T \geq T_0\}$

– or $a_{1T} < 0$ and $a_{2T} - a_{0T} + a_{1T} \geq 0 \; \forall T \geq 0 \Rightarrow p^* = max\{\overline{p_T}; T \geq T_0\}$

As a consequence, it is not possible to identify bounds such as $\beta_T \geq 0$ and to $\gamma_T \geq 0$ if $a_{1T} > 0$ and $a_{2T} - a_{0T} - 3a_{1T} < 0$ or if $a_{1T} < 0$ and $a_{2T} - a_{0T} + a_{1T} < 0$. It means that it is not possible to find a p that ensure that $\beta_T \geq 0$ and to $\gamma_T \geq 0$ at the same time, meaning that the reform has unexpected impacts on the outcome.

8.2 The tax system in France

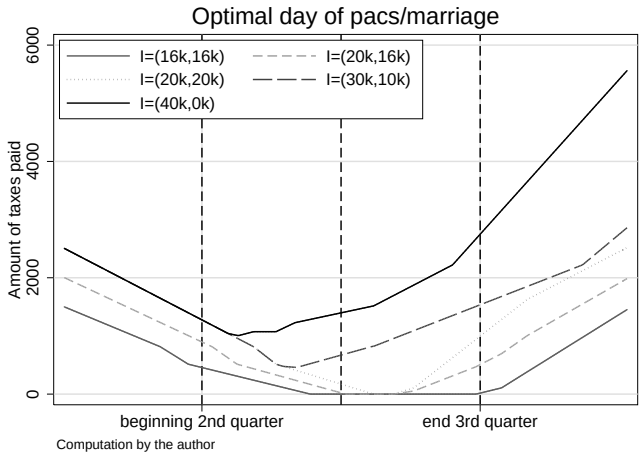


FIGURE 2.1: Optimal day - simulation

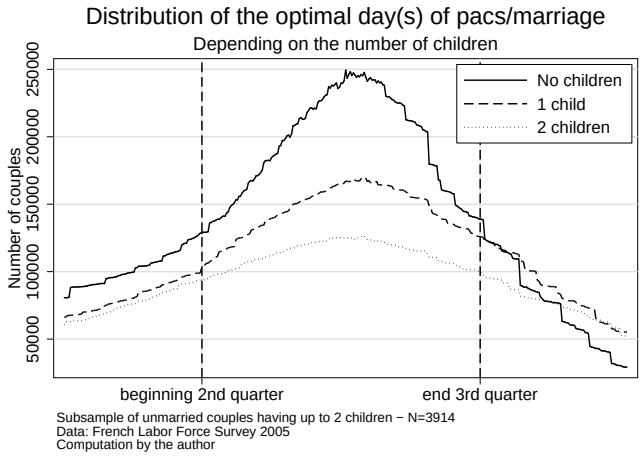


FIGURE 2.2: Optimal day - on LFS 2005

TABLE 2.2: Simulation of the effect of getting pacsed at the optimal day on taxes

Ratio of taxes saved	Mean ratio	Mean taxes saved	Income	Proportion of couples
0%	0	14.44	9370	.29
>0 and $\leq$ 80%	66.0	4347	66184	.06
>80 and $\leq$ 95%	88.4	3029	47156	.05
>95%	99.9	885.6	27565	.60

Ratio of taxes saved compared to a married couple, for a normal year.
Lecture : There are 6% of couples that would save between 0 and 80% of taxes compare to normal year of marriage. Among them, the average ratio of saved taxes is 66%, which represents an average 4347 amount of taxes saved. The average annual income of such couples is 66184.

8.3 Descriptive statistics

TABLE 2.3: Evolution of the pacs rate for 1000 persones aged 15-59

year	Mean	Stan.Dev.	Min	Max
2000	.50	.22	.04	1.65
2001	.45	.20	0	1.21
2002	.52	.23	.08	1.34
2003	.66	.27	.10	1.62
2004	.83	.36	.15	3.24
2005	1.36	.47	.19	3.29
2006	1.70	.56	.33	3.72
2007	2.20	.67	.36	4.36
2008	3.42	.90	.61	5.80
2009	4.05	1.11	.14	6.65

N=443

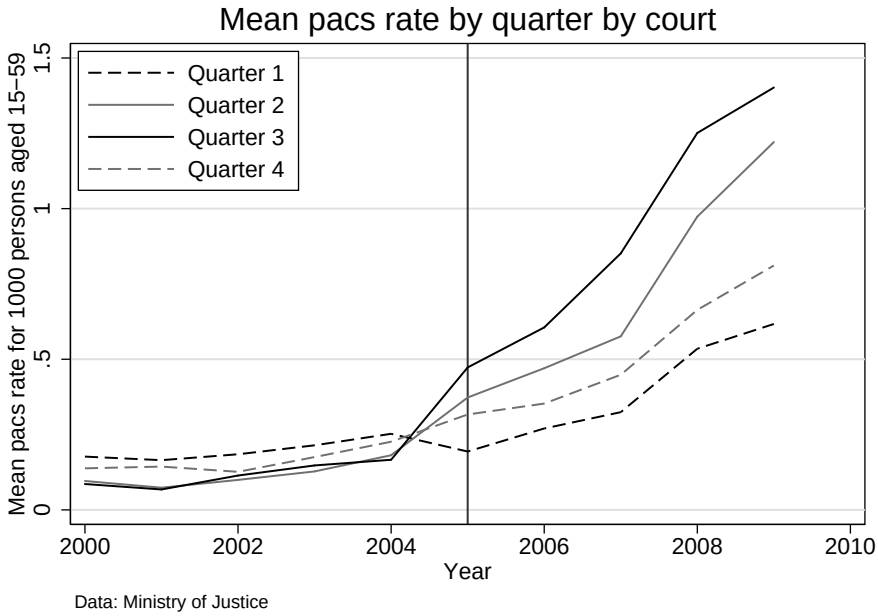
Lecture : In 2000, 0.5 pacs per 1000 persons aged 15-59 years old have been contracted by court. The minimum rate is 0.04 and the maximum is 1.65.

TABLE 2.4: Evolution of the rate of dissolution of pacs for 1000 pacs

year	Mean	Stan.Dev.	Min	Max
2000	.020	.046	0	.5
2001	.037	.039	0	.25
2002	.046	.039	0	.278
2003	.051	.032	0	.175
2004	.056	.031	0	.238
2005	.051	.026	0	.235
2006	.039	.017	0	.118
2007	.035	.017	0	.179
2008	.028	.011	0	.073
2009	.027	.009	0	.058

N=443. The denominator is the number of pacs contracted in the court before and during the year considered.

Lecture : In 2000, for 1000 pacs contracted (in stock) in the court, 0.2 have been broken up by court. The minimum rate is 0 and the maximum rate is 0.5 per 1000.



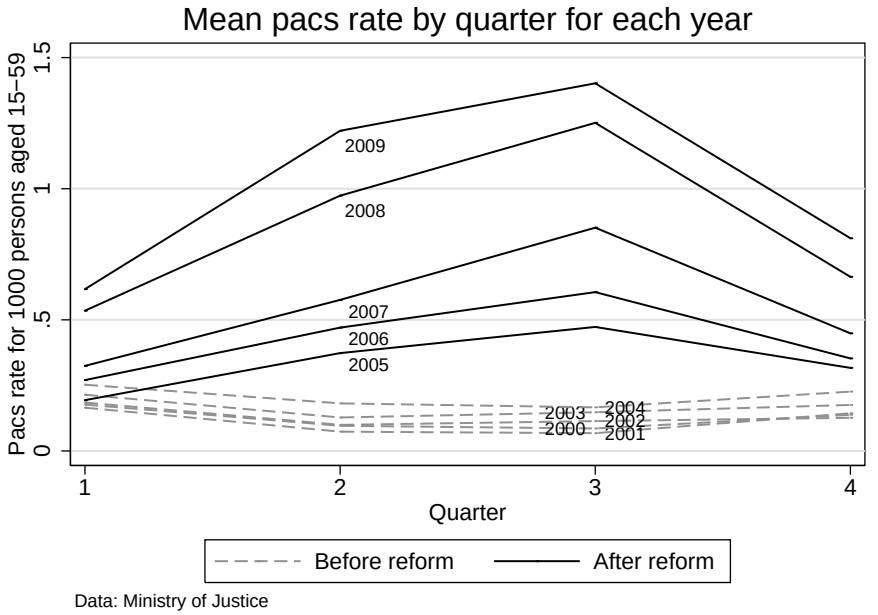
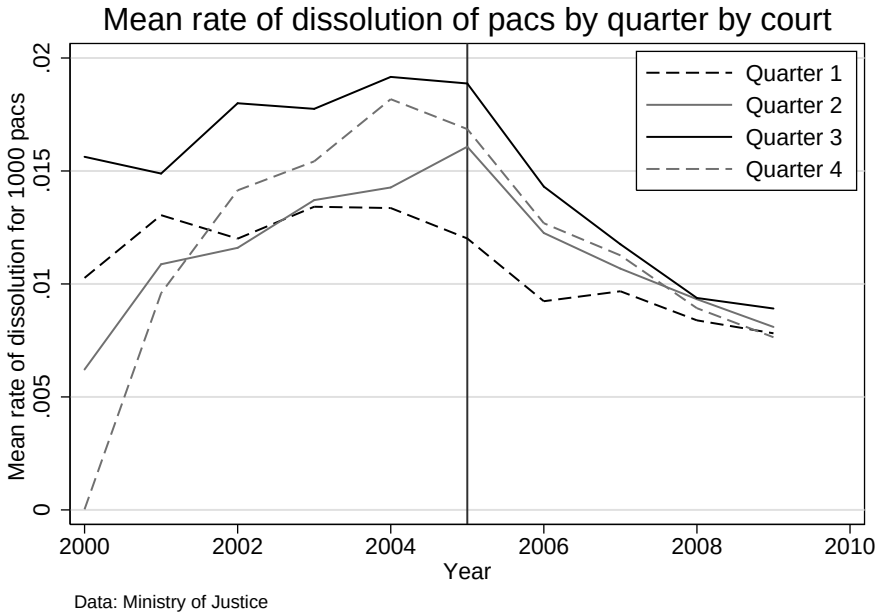


FIGURE 2.3: Pacs rates



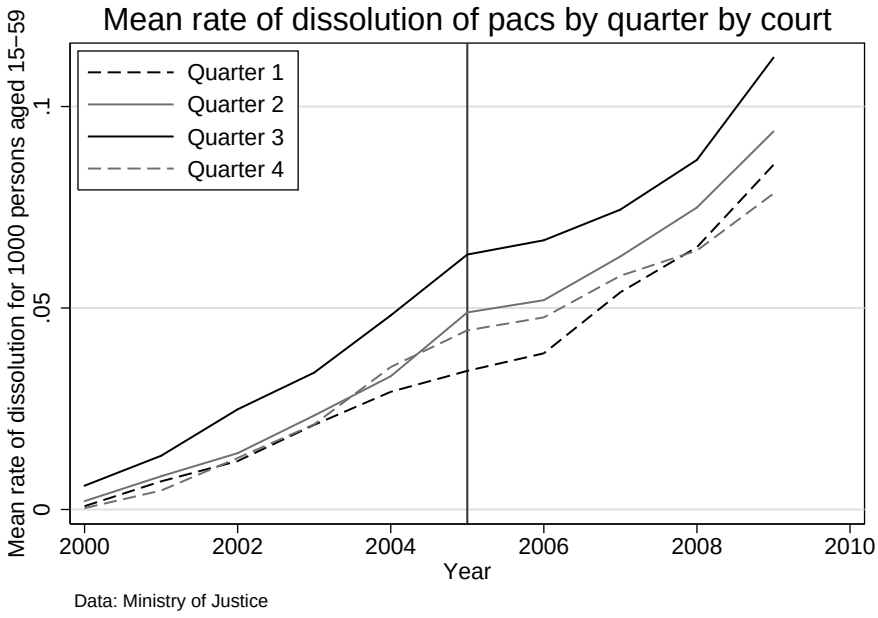


FIGURE 2.4: Rate of dissolution

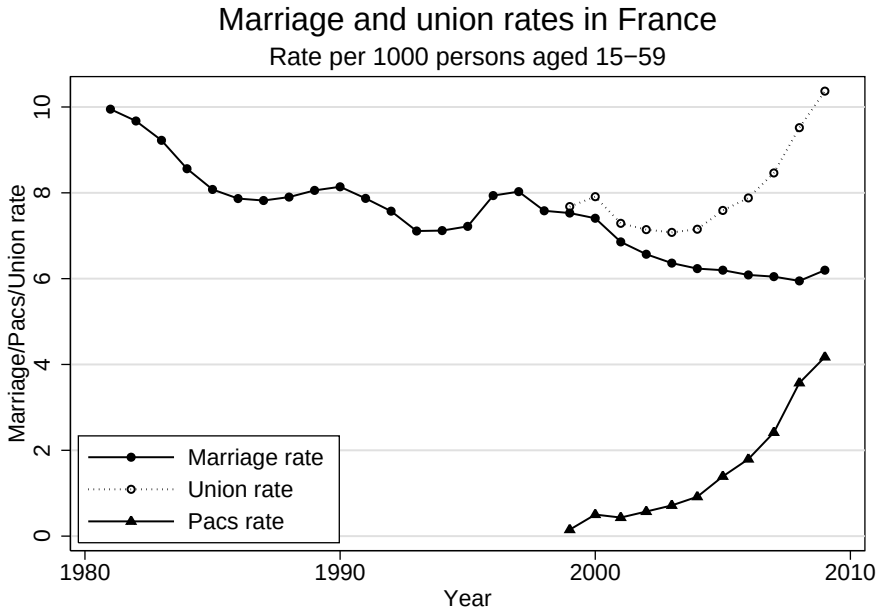


FIGURE 2.5: Rate of marriage/unions (for 1000 persons aged 15-59)

8.4 Results

TABLE 2.5: Difference in difference estimation

	(1)		(2)		(3)		(4)	
	Pacs for 1000 people aged 15-59				Pacs for 1000 couples			
Year 2001	.06***	(6.6e-03)	.06***	(6.8e-03)	-6.2e-03	(7.1e-03)	-3.6e-03	(.014)
Year 2002	.063***	(7.0e-03)	.062***	(7.3e-03)	-3.8e-03	(7.5e-03)	1.3e-03	(.024)
Year 2003	.141***	(8.1e-03)	.141***	(8.6e-03)	.075***	(8.6e-03)	.083**	(.035)
Year 2004	.231***	(.012)	.23***	(.012)	.164***	(.012)	.174***	(.047)
Year 2005	.262***	(8.8e-03)	.261***	(9.9e-03)	.195***	(8.8e-03)	.208***	(.057)
Year 2006	.374***	(9.7e-03)	.373***	(.012)	.308***	(9.7e-03)	.323***	(.068)
Year 2007	.524***	(.011)	.523***	(.014)	.458***	(.012)	.475***	(.079)
Year 2008	.95***	(.015)	.949***	(.017)	.883***	(.015)	.904***	(.09)
Year 2009	1.18***	(.02)	1.18***	(.022)	1.11***	(.02)	1.14***	(.1)
Sem. 2 × Year 2001	-.167***	(7.8e-03)	-.167***	(8.3e-03)	-.034***	(8.1e-03)	-.034***	(8.1e-03)
Sem. 2 × Year 2002	-.098***	(9.0e-03)	-.098***	(9.1e-03)	.036***	(9.0e-03)	.035***	(9.0e-03)
Sem. 2 × Year 2003	-.115***	(.01)	-.115***	(9.9e-03)	.019*	(9.5e-03)	.019*	(9.5e-03)
Sem. 2 × Year 2004	-.131***	(.014)	-.131***	(.014)	1.9e-03	(.013)	1.9e-03	(.013)
Sem. 2 × Year 2005	.336***	(.018)	.336***	(.016)	.469***	(.014)	.469***	(.014)
Sem. 2 × Year 2006	.453***	(.021)	.453***	(.019)	.586***	(.016)	.586***	(.016)
Sem. 2 × Year 2007	.655***	(.026)	.655***	(.025)	.788***	(.021)	.788***	(.021)
Sem. 2 × Year 2008	1.03***	(.035)	1.03***	(.034)	1.16***	(.028)	1.16***	(.028)
Sem. 2 × Year 2009	1.2***	(.044)	1.2***	(.043)	1.33***	(.037)	1.33***	(.037)
Constant	.248***	(4.8e-03)	.35	(.305)	.248***	(8.0e-03)	-4.16**	(1.65)
Fixed effect	No		No		Yes		Yes	
Controls	No		Yes		No		Yes	
Observations	8860		8860		8860		8860	
R^2	0.801		0.813		0.872		0.875	

Standard errors in parentheses. Standard errors are clustered at the court level.
Controls include : the rate of households for 1000 inhabitants (as a proxy for household size), the rate of owners, the rate of unemployment, the rate of active adults.
* p<0.1, ** p<0.05, *** p<0.01

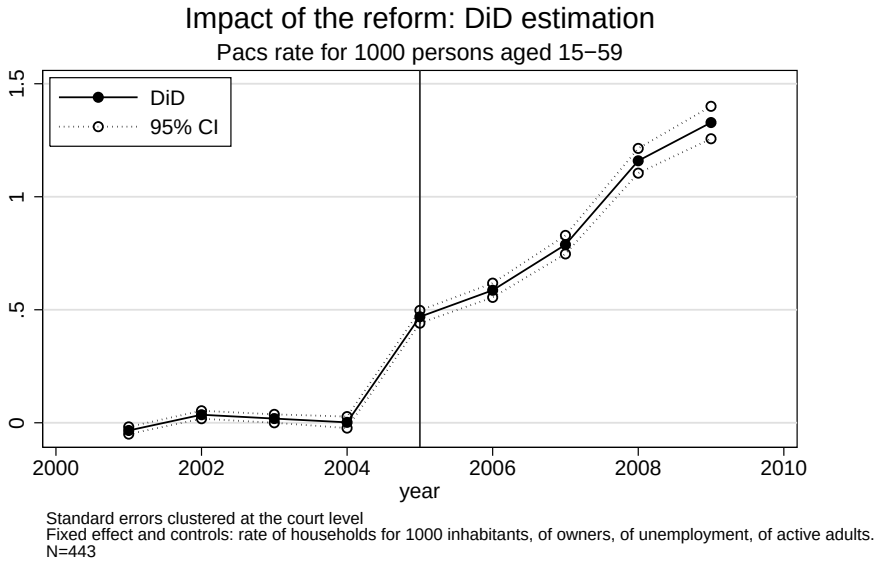


FIGURE 2.6: Did results - pacs rate (for 1000 persons aged 15-59)

TABLE 2.6: Regression results - pacs rate for 1000 persons ages 15-59

Spe	Year	a_{0T}		a_{1T}		a_{2T}		Condition	Sign a_{1T}	Controls	Fix. Eff.
1	2001	.0075	(.0087)	-.0177 ***	(.0066)	-.0461 ***	(.0065)	-	F		
1	2002	-.0081	(.0156)	.0192 ***	(.0064)	.0432 ***	(.007)	+	F		
1	2003	.0426 *	(.0224)	.0001	(.0067)	.056 ***	(.0071)	+	F		
1	2004	.0953 ***	(.03)	-.0127	(.0103)	.0775 ***	(.01)	-	F		
1	2005	.1874 ***	(.0362)	-.162 ***	(.0087)	.4852 ***	(.0131)	-	T	N	N
1	2006	.2252 ***	(.0434)	-.1216 ***	(.0081)	.6791 ***	(.0152)	-	T		
1	2007	.3225 ***	(.0499)	-.1632 ***	(.0086)	.9349 ***	(.0201)	-	T		
1	2008	.5396 ***	(.0571)	-.1681 ***	(.0108)	1.5167 ***	(.027)	-	T		
1	2009	.6885 ***	(.0638)	-.2332 ***	(.0143)	1.7677 ***	(.0361)	-	T		
2	2001	.0058	(.0048)	-.0177 ***	(.0066)	-.0461 ***	(.0065)	-	F		
2	2002	-.0116 **	(.0047)	.0193 ***	(.0064)	.0433 ***	(.0069)	+	F		
2	2003	.0374 ***	(.0053)	.0001	(.0067)	.056 ***	(.0071)	+	F		
2	2004	.0884 ***	(.0079)	-.0126	(.0103)	.0776 ***	(.01)	-	F		
2	2005	.1788 ***	(.0068)	-.1619 ***	(.0087)	.4853 ***	(.013)	-	T	N	Y
2	2006	.2149 ***	(.0069)	-.1216 ***	(.0081)	.6792 ***	(.0152)	-	T		
2	2007	.3106 ***	(.0076)	-.1631 ***	(.0087)	.935 ***	(.0201)	-	T		
2	2008	.526 ***	(.0096)	-.168 ***	(.0108)	1.5168 ***	(.027)	-	T		
2	2009	.6732 ***	(.0132)	-.2331 ***	(.0143)	1.7678 ***	(.0361)	-	T		
3	2001	.0057	(.0049)	-.0177 ***	(.0066)	-.0461 ***	(.0065)	-	F		
3	2002	-.0118 **	(.0052)	.0193 ***	(.0064)	.0433 ***	(.0069)	+	F		
3	2003	.037 ***	(.006)	.0001	(.0067)	.056 ***	(.0071)	+	F		
3	2004	.0879 ***	(.0087)	-.0126	(.0103)	.0776 ***	(.01)	-	F		
3	2005	.1782 ***	(.0083)	-.1619 ***	(.0087)	.4853 ***	(.013)	-	T	Y	N
3	2006	.2142 ***	(.0091)	-.1215 ***	(.0081)	.6792 ***	(.0152)	-	T		
3	2007	.3098 ***	(.0107)	-.1631 ***	(.0087)	.9351 ***	(.0201)	-	T		
3	2008	.5251 ***	(.0126)	-.1679 ***	(.0108)	1.5168 ***	(.027)	-	T		
3	2009	.6722 ***	(.0165)	-.233 ***	(.0143)	1.7678 ***	(.0361)	-	T		
4	2001	.0058	(.0048)	-.0177 ***	(.0066)	-.0461 ***	(.0065)	-	F		
4	2002	-.0116 **	(.0047)	.0193 ***	(.0064)	.0433 ***	(.0069)	+	F		
4	2003	.0374 ***	(.0053)	.0001	(.0067)	.056 ***	(.0071)	+	F		
4	2004	.0884 ***	(.0079)	-.0126	(.0103)	.0776 ***	(.01)	-	F		
4	2005	.1788 ***	(.0068)	-.1619 ***	(.0087)	.4853 ***	(.0131)	-	T	Y	N
4	2006	.2149 ***	(.0069)	-.1216 ***	(.0081)	.6792 ***	(.0152)	-	T		
4	2007	.3106 ***	(.0076)	-.1631 ***	(.0087)	.935 ***	(.0201)	-	T		
4	2008	.526 ***	(.0096)	-.168 ***	(.0108)	1.5168 ***	(.027)	-	T		
4	2009	.6732 ***	(.0132)	-.2331***	(.0143)	1.7678***	(.0361)	-	T		

When $a_{1T} < 0$, condition is equal to "T" (true) if the condition $a_{2T} - a_{2T} + a_{1T} \geq 0$ is verified and to "F" (false) otherwise. When $a_{1T} > 0$, condition is equal to "T" (true) if the condition $a_{2T} - a_{2T} - 3a_{1T} \geq 0$ is verified and to "F" (false) otherwise.

Controls include : the rate of households for 1000 inhabitants (as a proxy for household size), the rate of owners, the rate of unemployment, the rate of active adults.

Standard errors are clustered at the court level

TABLE 2.7: Regression results - pacs rate for 1000 couples

Spe	Year	a_{0T}		a_{1T}		a_{2T}		Sign a_{1T}	Condition	Controls	Fix. Eff.
1	2001	.0952 ***	(.022)	-.0438 ***	(.0153)	-.1114 ***	(.0151)	-	F		
1	2002	.1358 ***	(.0406)	.0455 ***	(.0148)	.1011 ***	(.0162)	+	F		
1	2003	.3327 ***	(.0592)	.0017	(.0152)	.1356 ***	(.0166)	+	F		
1	2004	.5357 ***	(.0792)	-.0309	(.023)	.1859 ***	(.0224)	-	F	N	N
1	2005	.833 ***	(.0967)	-.3915 ***	(.0206)	1.1753 ***	(.0347)	-	F		
1	2006	1.0013 ***	(.1171)	-.2982 ***	(.0197)	1.6451 ***	(.0411)	-	T		
1	2007	1.3059 ***	(.1339)	-.3949 ***	(.0206)	2.261 ***	(.0541)	-	T		
1	2008	1.8997 ***	(.1546)	-.418 ***	(.0261)	3.6302 ***	(.0711)	-	T		
1	2009	2.3269 ***	(.1715)	-.5709 ***	(.0347)	4.2418 ***	(.0927)	-	T		
2	2001	.0127	(.0111)	-.0429 ***	(.0153)	-.1104 ***	(.0151)	-	F		
2	2002	-.0282 **	(.0113)	.0473 ***	(.0148)	.103 ***	(.0161)	+	F		
2	2003	.088 ***	(.0123)	.0044	(.0152)	.1383 ***	(.0166)	+	F		
2	2004	.2111 ***	(.0181)	-.0275	(.0229)	.1894 ***	(.0224)	-	F	N	Y
2	2005	.4294 ***	(.0165)	-.3872 ***	(.0206)	1.1796 ***	(.0348)	-	T		
2	2006	.5196 ***	(.0171)	-.2931 ***	(.0196)	1.6501 ***	(.0411)	-	T		
2	2007	.7467 ***	(.0187)	-.3891 ***	(.0206)	2.2668 ***	(.0542)	-	T		
2	2008	1.2638 ***	(.0247)	-.4115 ***	(.0259)	3.6367 ***	(.0712)	-	T		
2	2009	1.615 ***	(.0337)	-.5638 ***	(.0346)	4.249 ***	(.0928)	-	T		
3	2001	.0201 *	(.0116)	-.043 ***	(.0153)	-.1105 ***	(.0151)	-	F		
3	2002	-.0134	(.013)	.0472 ***	(.0148)	.1028 ***	(.0162)	+	F		
3	2003	.11 ***	(.0149)	.0042	(.0152)	.1381 ***	(.0166)	+	F		
3	2004	.2404 ***	(.021)	-.0277	(.023)	.1891 ***	(.0224)	-	F		
3	2005	.4659 ***	(.0211)	-.3875 ***	(.0206)	1.1793 ***	(.0348)	-	T	Y	N
3	2006	.5632 ***	(.0236)	-.2935 ***	(.0196)	1.6497 ***	(.0411)	-	T		
3	2007	.7973 ***	(.0274)	-.3895 ***	(.0207)	2.2664 ***	(.0542)	-	T		
3	2008	1.3214 ***	(.0328)	-.412 ***	(.026)	3.6362 ***	(.0712)	-	T		
3	2009	1.6796 ***	(.0426)	-.5643 ***	(.0346)	4.2484 ***	(.0928)	-	T		
4	2001	.0127	(.0111)	-.0429 ***	(.0153)	-.1104 ***	(.0151)	-	F		
4	2002	-.0282 **	(.0113)	.0473 ***	(.0148)	.103 ***	(.0161)	+	F		
4	2003	.088 ***	(.0123)	.0044	(.0152)	.1383 ***	(.0166)	+	F		
4	2004	.2111 ***	(.0181)	-.0275	(.0229)	.1894 ***	(.0224)	-	F		
4	2005	.4294 ***	(.0165)	-.3872 ***	(.0206)	1.1796 ***	(.0348)	-	T	Y	Y
4	2006	.5196 ***	(.0171)	-.2931 ***	(.0196)	1.6501 ***	(.0411)	-	T		
4	2007	.7467 ***	(.0187)	-.3891 ***	(.0206)	2.2668 ***	(.0542)	-	T		
4	2008	1.2638 ***	(.0247)	-.4115 ***	(.0259)	3.6367 ***	(.0712)	-	T		
4	2009	1.615***	(.0337)	-.5638***	(.0346)	4.249***	(.0928)	-	T		

When $a_{1T} < 0$, condition is equal to "T" (true) if the condition $a_{2T} - a_{2T} + a_{1T} \geq 0$ is verified and to "F" (false) otherwise. When $a_{1T} > 0$, condition is equal to "T" (true) if the condition $a_{2T} - a_{2T} - 3a_{1T} \geq 0$ is verified and to "F" (false) otherwise.

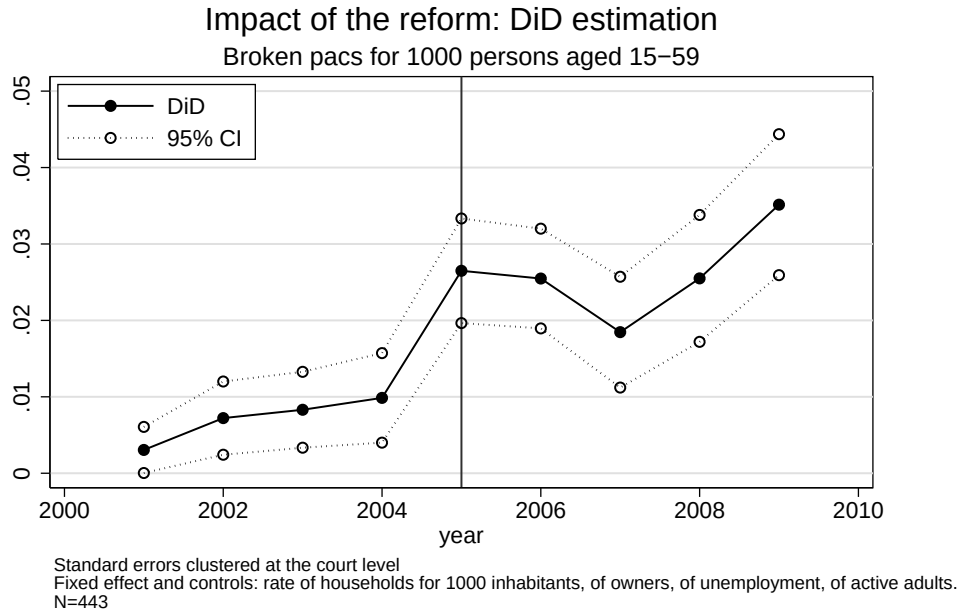
Controls include : the rate of households for 1000 inhabitants (as a proxy for household size), the rate of owners, the rate of unemployment, the rate of active adults.

Standard errors are clustered at the court level

TABLE 2.8: Difference in difference estimation on broken up pacs

	(1)		(2)		(3)		(4)	
	Broken pacs for 1000 people aged 15-59				Broken pacs for 1000 pacs (stock)			
Year 2001	.00715***	(.000927)	.0106***	(.000981)				
Year 2002	.0202***	(.00136)	.0236***	(.00144)	.000626	(.0024)	.00109	(.00367)
Year 2003	.0376***	(.00181)	.041***	(.00197)	.00362*	(.00207)	.00408	(.00359)
Year 2004	.06***	(.00234)	.0634***	(.00256)	.0061***	(.00189)	.00656*	(.00362)
Year 2005	.0743***	(.00251)	.0777***	(.00272)	.00337*	(.00185)	.00383	(.00352)
Year 2006	.0819***	(.00261)	.0853***	(.00285)	-.00405**	(.00168)	-.00358	(.00338)
Year 2007	.107***	(.0031)	.111***	(.00333)	-.00509***	(.00173)	-.00462	(.00337)
Year 2008	.125***	(.00331)	.128***	(.00356)	-.00874***	(.00167)	-.00827**	(.00337)
Year 2009	.159***	(.00383)	.163***	(.00412)	-.0108***	(.00165)	-.0103***	(.00337)
Year 2001×Sem. 2	.00987***	(.00132)	.00306**	(.00154)				
Year 2002×Sem. 2	.014***	(.00223)	.00723***	(.00244)	.00342	(.00234)	.00275	(.00444)
Year 2003×Sem. 2	.0151***	(.00233)	.00833***	(.00253)	.00217	(.00175)	.00151	(.00436)
Year 2004×Sem. 2	.0167***	(.00272)	.00989***	(.00299)	.00184	(.0014)	.00117	(.00448)
Year 2005×Sem. 2	.0333***	(.00327)	.0265***	(.00349)	.00695***	(.00131)	.00629	(.00427)
Year 2006×Sem. 2	.0323***	(.00309)	.0255***	(.00333)	.00524***	(.000921)	.00458	(.00407)
Year 2007×Sem. 2	.0253***	(.00352)	.0185***	(.0037)	.00178**	(.000772)	.00111	(.00399)
Year 2008×Sem. 2	.0324***	(.00401)	.0256***	(.00423)	.00171***	(.000592)	.00104	(.00398)
Year 2009×Sem. 2	.042***	(.0044)	.0352***	(.0047)	.00187***	(.000479)	.0012	(.00399)
Constant	.00456***	(.00036)	.00456***	(.00163)	.0268***	(.00164)	.0267***	(.00161)
Observations	8860		8860		8415		8415	
R^2	0.487		0.594		0.037		0.040	
Fixed effect	N		Y		N		Y	

Standard errors in parentheses. Standard errors are clustered at the court level.
* p<0.1, ** p<0.05, *** p<0.01



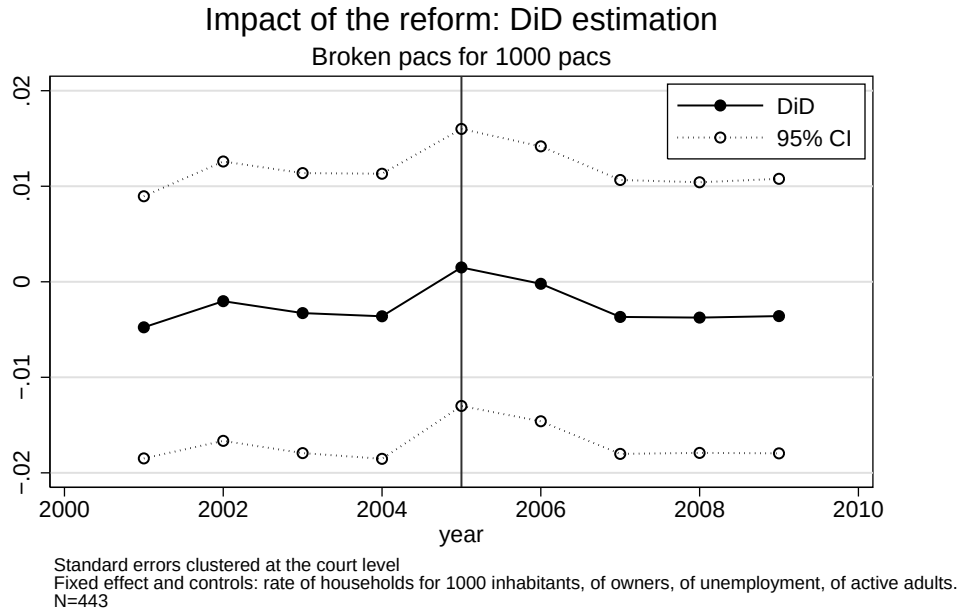


FIGURE 2.7: DiD results - broken pacs (for 1000 persons aged 15-59)

TABLE 2.9: Regression results - broken up pacs

outcome	Year	a_{0T}		a_{1T}		a_{2T}		sign a_{1T}	condition	Fixed effects
	2002	4.555 ***	(1.748)	-4.422	(3.138)	-0.714	(2.802)	-	F	
	2003	5.836 ***	(1.554)	-4.292	(2.942)	-0.250	(2.721)	-	F	
Rate	2004	8.588 ***	(1.560)	-7.100 **	(2.965)	-0.854	(2.672)	-	F	Y
for 1000	2005	7.266 ***	(1.428)	-7.124 **	(2.873)	2.851	(2.557)	-	F	
pacs	2006	3.098 **	(1.304)	-5.734 **	(2.814)	-2.105	(2.282)	-	F	
	2007	1.677	(1.337)	-3.872	(2.754)	-5.191 **	(2.316)	-	T	
	2008	-0.662	(1.300)	-2.820	(2.766)	-6.568 ***	(2.212)	-	T	
	2009	-1.948	(1.316)	-2.106	(2.758)	-7.138 ***	(2.265)	-	T	
	2002	-3.318 **	(1.691)	-2.140	(1.506)	16.669 ***	(1.870)	-	T	
	2003	-2.037	(1.508)	-2.010 *	(1.210)	17.133 ***	(1.480)	-	T	
Rate	2004	0.715	(1.437)	-4.818 ***	(1.130)	16.529 ***	(1.292)	-	T	
for 1000	2005	-0.608	(1.355)	-4.842 ***	(0.893)	20.234 ***	(1.203)	-	T	N
pacs	2006	-4.775 ***	(1.240)	-3.452 ***	(0.656)	15.278 ***	(0.864)	-	T	
	2007	-6.196 ***	(1.277)	-1.590 ***	(0.587)	12.192 ***	(0.746)	-	T	
	2008	-8.536 ***	(1.203)	-0.538	(0.424)	10.815 ***	(0.504)	-	T	
	2009	-9.822 ***	(1.211)	0.176	(0.323)	10.245 ***	(0.434)	+	T	
	2001	0.004 ***	(0.001)	0.002 **	(0.001)	0.009 ***	(0.001)	+	F	
	2002	0.012 ***	(0.001)	-0.001	(0.001)	0.018 ***	(0.002)	-	T	
Rate	2003	0.021 ***	(0.001)	-0.001	(0.002)	0.029 ***	(0.002)	-	T	
for 1000	2004	0.035 ***	(0.002)	-0.007 ***	(0.002)	0.038 ***	(0.003)	-	F	Y
persons	2005	0.044 ***	(0.002)	-0.011 ***	(0.002)	0.060 ***	(0.003)	-	T	
15-59 y.o.	2006	0.047 ***	(0.002)	-0.009 ***	(0.002)	0.063 ***	(0.003)	-	T	
	2007	0.058 ***	(0.002)	-0.005 *	(0.003)	0.072 ***	(0.004)	-	T	
	2008	0.064 ***	(0.002)	0.000	(0.003)	0.090 ***	(0.004)	+	T	
	2009	0.078 ***	(0.002)	0.007 **	(0.003)	0.120 ***	(0.004)	+	T	
	2001	0.002 ***	(0.001)	0.002 ***	(0.001)	0.017 ***	(0.001)	+	T	
	2002	0.010 ***	(0.001)	-0.001	(0.001)	0.026 ***	(0.002)	-	T	
Rate	2003	0.018 ***	(0.001)	-0.001	(0.002)	0.036 ***	(0.002)	-	T	
for 1000	2004	0.032 ***	(0.002)	-0.006 ***	(0.002)	0.046 ***	(0.003)	-	T	
persons	2005	0.041 ***	(0.002)	-0.010 ***	(0.002)	0.068 ***	(0.003)	-	T	N
15-59 y.o.	2006	0.045 ***	(0.002)	-0.009 ***	(0.002)	0.071 ***	(0.003)	-	T	
	2007	0.055 ***	(0.002)	-0.004	(0.003)	0.079 ***	(0.004)	-	T	
	2008	0.061 ***	(0.002)	0.001	(0.003)	0.097 ***	(0.004)	+	T	
	2009	0.075 ***	(0.002)	0.007 **	(0.003)	0.128 ***	(0.004)	+	T	

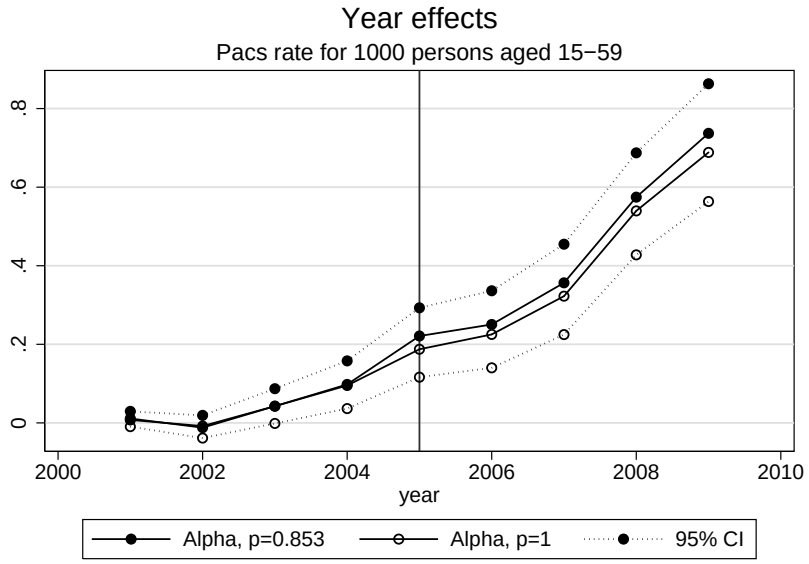
When $a_{1T} < 0$, condition is equal to "T" (true) if the condition $a_{2T} - a_{2T} + a_{1T} \geq 0$ is verified and to "F" (false) otherwise. When $a_{1T} > 0$, condition is equal to "T" (true) if the condition $a_{2T} - a_{2T} - 3a_{1T} \geq 0$ is verified and to "F" (false) otherwise.

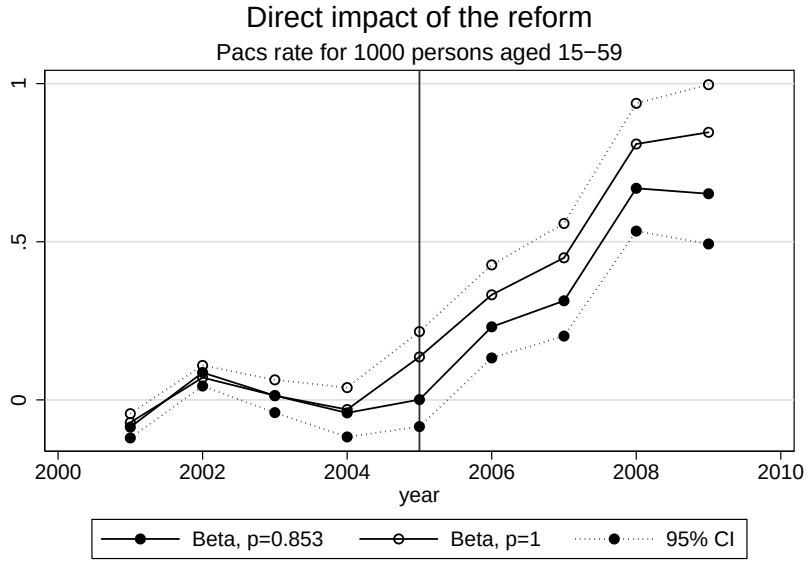
TABLE 2.10: Regression results - estimation of the γ_T, β_T and the α_T

year	$\gamma_T(\underline{p})$	σ	$\gamma_T(1)$	σ	$\alpha_T(\underline{p})$	σ	$\alpha_T(1)$	σ	$\beta_T(1)$	σ	$\beta_T(\underline{p})$	σ
Explained variable : pacs rate for 1000 persons aged 15-59. Specification included court fixed effect and controls												
$\underline{p} = 0.853$												
2001	.0251 ***	(0.000)	.0177 ***	(.0066)	.0112	(.0081)	.0075	(.0087)	-.0861 ***	(.0144)	-.0714 ***	(.0142)
2002	-.0273 ***	(0.000)	-.0192 ***	(.0064)	-.0121	(.0151)	-.0081	(.0156)	.0866 ***	(.0199)	.0706 ***	(.0196)
2003	-.0001 ***	(0.000)	-.0001	(.0067)	.0426 *	(.0221)	.0426 *	(.0224)	.0135	(.0258)	.0134	(.0255)
2004	.018 ***	(0.000)	.0127	(.0103)	.0979 ***	(.0292)	.0953 ***	(.03)	-.041	(.035)	-.0304	(.0353)
2005	.2294 ***	(0.000)	.162 ***	(.0087)	.2211 ***	(.0357)	.1874 ***	(.0362)	.001	(.0395)	.1359 ***	(.0409)
2006	.1723 ***	(0.000)	.1216 ***	(.0081)	.2505 ***	(.0427)	.2252 ***	(.0434)	.231 ***	(.0474)	.3323 ***	(.0482)
2007	.2311 ***	(0.000)	.1632 ***	(.0086)	.3565 ***	(.0496)	.3225 ***	(.0499)	.3133 ***	(.0557)	.4492 ***	(.0554)
2008	.238 ***	(0.000)	.1681 ***	(.0108)	.5746 ***	(.0565)	.5396 ***	(.0571)	.6691 ***	(.0622)	.8091 ***	(.0656)
2009	.3303 ***	(0.000)	.2332 ***	(.0143)	.737 ***	(.0629)	.6885 ***	(.0638)	.6518 ***	(.0739)	.846 ***	(.0768)
Explained variable : pacs rate for 1000 couples. Specification included court fixed effect and controls												
$\underline{p} = 0.817$												
2001	.0691 ***	(0.000)	.0438 ***	(.0153)	.1078 ***	(.0207)	.0952 ***	(.022)	-.301 ***	(.0344)	-.2504 ***	(.0344)
2002	-.0718 ***	(0.000)	-.0455 ***	(.0148)	.1227 ***	(.0393)	.1358 ***	(.0406)	.0633	(.0486)	.0108	(.0494)
2003	-.0027 ***	(0.000)	-.0017	(.0152)	.3322 ***	(.0585)	.3327 ***	(.0592)	-.1933 ***	(.0654)	-.1953 ***	(.0655)
2004	.0488 ***	(0.000)	.0309	(.023)	.5446 ***	(.0776)	.5357 ***	(.0792)	-.4165 ***	(.0875)	-.3807 ***	(.0897)
2005	.6175 ***	(0.000)	.3915 ***	(.0206)	.946 ***	(.0957)	.833 ***	(.0967)	-.5012 ***	(.098)	-.0492	(.1075)
2006	.4703 ***	(0.000)	.2982 ***	(.0197)	1.0874 ***	(.115)	1.0013 ***	(.1171)	.0013	(.1207)	.3456 ***	(.1303)
2007	.6229 ***	(0.000)	.3949 ***	(.0206)	1.4199 ***	(.1331)	1.3059 ***	(.1339)	.1043	(.1368)	.5602 ***	(.148)
2008	.6593 ***	(0.000)	.418 ***	(.0261)	2.0203 ***	(.1521)	1.8997 ***	(.1546)	.8298 ***	(.154)	1.3125 ***	(.1775)
2009	.9005 ***	(0.000)	.5709 ***	(.0347)	2.4917 ***	(.1692)	2.3269 ***	(.1715)	.6848 ***	(.1819)	1.344 ***	(.2035)

TABLE 2.11: Estimated effect of the reform

	direct impact				Schedule impact			
	Lower bound		Upper bound		Lower bound		Upper bound	
Explained variable : pacs rate for 1000 persons aged 15-59								
2001	-.191 ***	(.032)	-.159 ***	(.032)	.039 ***	(.015)	.056 ***	(0.000)
2002	.165 ***	(.038)	.134 ***	(.037)	-.037 ***	(.012)	-.052 ***	(0.000)
2003	.02	(.039)	.02	(.038)	0	(.01)	0 ***	(0.000)
2004	-.05	(.042)	-.037	(.043)	.015	(.012)	.022 ***	(0.000)
2005	.001	(.029)	.1 ***	(.03)	.119 ***	(.006)	.169 ***	(0.000)
2006	.136 ***	(.028)	.196 ***	(.028)	.072 ***	(.005)	.101 ***	(0.000)
2007	.142 ***	(.025)	.204 ***	(.025)	.074 ***	(.004)	.105 ***	(0.000)
2008	.195 ***	(.018)	.236 ***	(.019)	.049 ***	(.003)	.07 ***	(0.000)
2009	.161 ***	(.018)	.209 ***	(.019)	.058 ***	(.004)	.082 ***	(0.000)
Explained variable : pacs rate for 1000 couples								
2001	-.68 ***	(.081)	-.632 ***	(.082)	.098 ***	(.034)	.123 ***	(0.000)
2002	-.066	(.105)	-.108	(.106)	-.085 ***	(.028)	-.106 ***	(0.000)
2003	-.444 ***	(.115)	-.445 ***	(.115)	-.001	(.023)	-.001 ***	(0.000)
2004	-.641 ***	(.122)	-.622 ***	(.126)	.039	(.028)	.049 ***	(0.000)
2005	-.301 ***	(.085)	-.158 *	(.093)	.29 ***	(.015)	.362 ***	(0.000)
2006	0	(.083)	.087	(.09)	.177 ***	(.012)	.22 ***	(0.000)
2007	.061	(.073)	.151 *	(.079)	.181 ***	(.009)	.225 ***	(0.000)
2008	.247 ***	(.051)	.307 ***	(.06)	.123 ***	(.008)	.153 ***	(0.000)
2009	.19 ***	(.052)	.26 ***	(.058)	.142 ***	(.009)	.177 ***	(0.000)





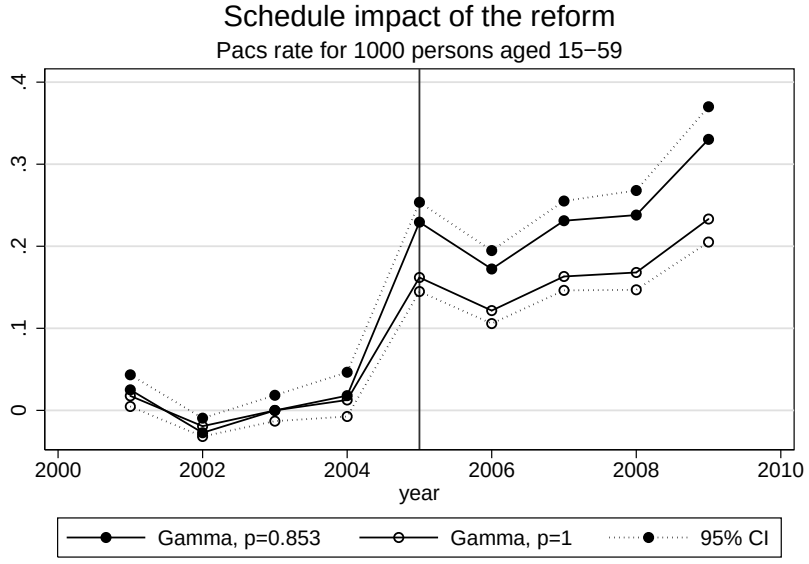


FIGURE 2.8: Estimated parameters : lower and upper bounds (pacs rate for 1000 persons aged 15-59)

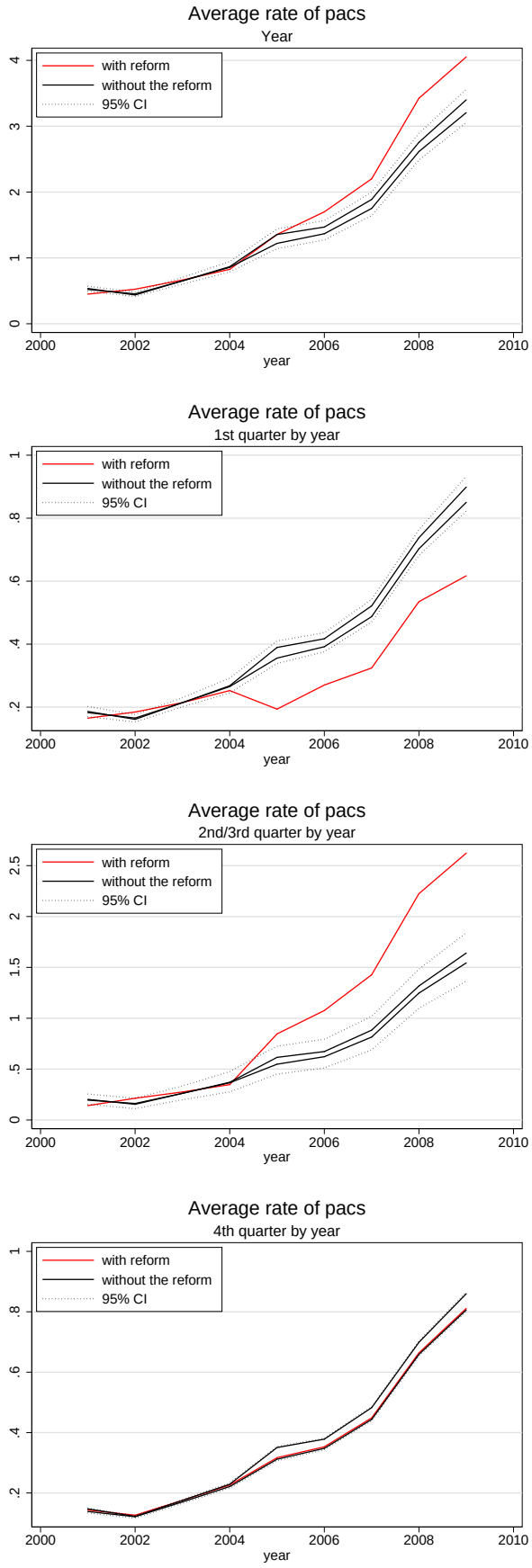


FIGURE 2.9: Estimated counterfactuals : lower and upper bounds (pacs rate for 1000 persons aged 15-59)

CHAPITRE 3

Competing marital contracts ?
The marriage after civil union in France

1 Introduction

Societies in Western Europe and Northern America witnessed large changes in the household formation during the second half of the 20^{th} century : less marriages, decrease in crude marital rates, but also in hazard rates, increasing divorce rates, cohabitation preceding marriage, and rising age at first marriage. These changes denote a change in the demand for marital contracts, that can be linked to economic changes (education and labor supply of women) and to social norms (decrease in the stigma associated to divorce).

The family economics mostly focuses on the economics of being together rather than single, analyzing domestic arrangements such as the household formation and who marry whom (Becker, 1973, 1974; Hitsch, Hortacsu, and Ariely, 2010), the hou-

sehold decision as fertility and labor supply (Becker, 1981) or how these choices are determined (unitary model and collective models of households). The literature has paid little attention to the decision to contract a marriage rather than cohabiting. But as explained by Stevenson and Wolfers (2007), the growing number of divorces and cohabitation preceding marriage has decoupled the household formation from the marriage, raising new important economic questions. Marriage is not just a label but it has economic content : it changes tax treatment, it can make assets common, it could be taken into account for family benefit. As a consequence, the development of cohabitation preceding marriage introduces difference of treatment between couples, including at the separation. The understanding of modern families requires the understanding of the reason why couples decide to contract a marriage, or not. As the label has economic, the choice could be linked to economic reasons.

A recent stream of literature analyzes the decision to contract a marriage developing models based on cooperative games (Matouschek and Rasul, 2008; Cigno, 2009), and how the legal features can shape both the decision to divorce and to marry (Wolfers, 2006; Friedberg, 1998; Drewianka, 2008; Stevenson, 2007). Empirical papers require some variations in the legal features of marriage to identify any impact of the legal framework on the decision to contract a marriage. But the empirical literature faces a serious identification problem : the evolution of the marital contract (supply side) and the use of this marital contract (demand side) are closely related because it has evolved to take into account the evolution of the society.

The supply of marital contracts has evolved during the last decades : most countries have passed less stringent divorce law, such as no-fault divorce, or unilateral divorce in the US. In many Western Europe countries, the supply for marital contract has also been extended : the claim of same-sex couples led to the creation of alternative marriage contracts, often called Civil Unions or Registered Partnership. In most countries, however, this alternative contract is available for same-sex couples only. But

other countries, such as France, the Netherlands and Belgium, made it available to different-sex couples, creating a median way between cohabitation and marriage. The terms of Civil Unions contracts are very different from one country to the other. In France, the pacs [1] has been created in 1999. While political debates mostly focused on giving a legal marital status to same sex couples, it has been opened to different sex couples since its creation. It is close to marriage, but easier to break up. The number of contracted pacs has been increasing since 2000. In 2009, two pacs are contracted for three marriages.

The diversification in the supply of marital contracts and the success of the pacs reveals a demand for different marital contracts. The goal of this paper is modest : it tries to determine if this success had any consequence on the marriage, analyzing a potential link of substitution between the two contracts. The study of the evolution of the age at first marriage before and after the creation of the pacs aims at determining if the decision to contract a marriage has been affected by the pacs. Indeed, if pacs and marriage are close substitute, the age at first marriage could traduce the link of substitution. It could be affected if the pacsed population is the population that would have contracted a marriage if the pacs has not existed. But it is not affected if they are different populations. Therefore, the issue of substitution between pacs and marriage gives further insights on the decision to contract a marriage : the use of two distinct contracts by two distinct populations reveals a need for different marital contracts, because the reasons to legalize the union are heterogenous in the population.

In order to determine a potential substitution between marriage and pacs, the paper analyzes the evolution of the marriage rates and the age at first marriage before and after the creation of the pacs. Two types of substitution could be investigated. Long term substitution induces less marriages at the end of the life span. Short term

1. pacs stands for Pacte Civil de Solidarité (Civil Pact of Solidarity). The word is now very common in French and some derivative have been rapidly created : the verb "se pacser" (that I will translate in "to pacs" means "to contract a pacs" and can be adapted in "to be pacsed", for example) is now in the dictionnary Le Larousse.

substitution induces a delay of the first marriage. Both of them can be detected analyzing the age at first marriage, taking into account that the observation could be censored for individuals that do not get married. Micro data on pacsed couples and on a potential transition from pacs to marriage are not available. As a consequence, a micro-based study of the duration until the first marriage is contracted can not be made. This would be clearly the best way to investigate the potential link of substitution between the two contracts. As a consequence, only the information on married couples and their age at marriage can be used. There are two ways of examining the evolution of the age at first marriage : the period and the cohort analysis. The period analysis focuses on the age at first marriage and marriage rates during the year and the evolution year by year. As a consequence, a period indicator is constructed with a single year, with different cohorts, at different ages. The cohort analysis focuses on how cohorts evolve : a cohort indicator is constructed with a single cohort, observed at different years, at different ages. These two types of analysis are two ways to examine the same data. Indeed, age, period and cohort are linked by the straightforward identity : $period = cohort + age$. However, the two types of analysis are not doing equally well for the analysis of substitution between pacs and marriage.

The advantage of the period analysis is that it makes it easy to compare the period before the introduction of pacs to the period after. The main drawback is that the period analysis indicates how a fictitious cohort behaves if it has at different ages the marriage rates observed during the year. It does not give the behavior of any real cohort unless a certain stability in the behavior of cohorts is assumed. Indeed, it requires the assumption that today younger cohort will behave the same way as today older cohorts when they will be the same way. So this hypothesis is obviously false if the pacs makes couples delay their marriage. So the period analysis just permits the observation of changes after the creation of the pacs but it prevents from identifying substitution between pacs and marriage. The advantage of the cohort analysis is that it does not

require any assumption of stability of the behavior across cohorts. The main drawback is that the young cohorts are not observed all their life span, and only the behavior at young age is observable. As a consequence, the empirical analysis of the paper is divided into two parts. The first part uses classical period indicator to measure if any changes in marriage rates and the age at first marriage are observable after the creation of the pacs. The second part is based on the evolution of cohorts. It analyzes if any changes in the distribution of the age at first marriages is observable for cohorts affected by the introduction of the pacs, taking into account that cohorts are not affected by the creation of the pacs at the same age. As the observation of the marriage behavior is censored for the youngest cohorts, I do not pay attention to classical features of the distribution of the age at first marriage such as mean and variance because they are not observed. But as the bottom of the distribution of the ages at first marriage is observed, I examine the quantiles of the distribution. I try to detect if the quantile function conditional on cohort is changing after the creation of the pacs.

The paper shows that if any, the impact of pacs on the timing of marriage is rather small. Quite surprisingly, the pacs does not seem to affect much the timing of marriage.

After presenting the main evolution of marriage and pacs in France in section 2, I make explicit what could be the link between pacsed and marriage in section 3. I analyze the evolution of marriage rates and of the mean age at marriage in section 4, and propose an evaluation of the introduction of the pacs on quantiles of the distribution of the age at first marriage in section 5. Section 6 concludes.

2 Marriage and pacs

2.1 Marriage : key historical changes

The second half of the 20^{th} century witnesses large changes in the marriage law in France. It modified the relationship between the spouses and the link between children

and the marital status of their parents.

The law evolved toward more equality between spouses. Since 1965, women can have a bank account and get a job without their husband's consent. Equality between spouses is enacted in 1970 : the father authority disappeared as the only authority in the household and it is replaced by parental authority. The divorce law changed to facilitate the exit from marriage. The no-fault divorce is made possible in 1975, but unilateral divorce is not permitted in France. Divorce procedures have been simplified in 2005 when the spouses agree on the division of assets.

In the same time, the notion of parenthood has been progressively removed from the marital status. Since 1972, the law stipulates that acknowledged out-of-wedlock children have to be treated equal to in-the-wedlock children in terms of inheritance. As a consequence, the marriage of the parents of an out-of-wedlock child does not change anything in the eyes of the law. This equality has been extended to acknowledged children born of adultery in 2001, who are now equal in all respects to in-the-wedlock children. All differences between children according to the marital status of parents have been removed. Vital statistics on marriage do not register if the spouses already have children when they get married since 2005.

The consequence of these changes is that the marriage become a contract enacting the couple but not the family links, that are now independent of the marital status of the parents [2].

The evolution of the law came jointly with the evolution of the household formation : the number of marriages is declining since the early 1970s (see fig. 3.1), while the number of out-of-wedlock births increased progressively. The number of out-of-wedlock births is greater than in-the-wedlock births since 2006. Most unions started with a cohabitation period : Toulemon (1996) indicates that in 1994, almost 90% of

2. The only remaining difference is that the father of a new born child is by default the husband when the mother is married, but the child has to be explicitly acknowledged by the father if the mother is not married.

marriages started with a cohabitation period. As a consequence, the pacs has been created whereas the society experienced large changes in the household formation and marriage is not necessarily a stepping stone in the family formation.

2.2 The introduction of pacs : a competing contract ?

The pacs was created in November 1999. It concludes 10 years of debates on the possibility to create a marital contract for same sex couples, as Denmark did in 1989. But it mostly concludes two years of highly tense debates. The leading idea of the pacs was to provide a legal status to unmarried couples, therefore including same sex couples. However, the political debates mostly focused on the social consequences of providing same sex couples a legal form of union, that would entitle same sex couples to legal recognition.

At the beginning, the pacs has been made on purpose different from marriage (see tab. 3.1 for a comparison of the contracts). Pacs and marriage are similar to a certain extent : both contracts target couples : although the possibility to make the pacs available for relatives has been considered, it has not been left in the final text. Both ensure protection to partners : in case of death, the surviving partner can not be booted out the common housing. The pacs is a contract made to help partners "organizing their common life" [3]. As a consequence, pacsed partners are jointly responsible for debts and the pacs ensured by default a joint property of assets, unless the contract has been modified when it was signed. But the pacs was not created equal to marriage. Indeed, all couples can contract a pacs, including same sex couples. Moreover, a pacs can be broken up with mutual consent or unilaterally. In those cases, a simple letter is enough to break up the union. A pacs is automatically broken up if at least one partner get married or in case of death of one partner. Even if the divorce procedure has been

3. Loi n°99-944 du 15 novembre 1999, Art. 515-1 "Un pacte civil de solidarité est un contrat conclu par deux personnes physiques majeures, de sexe différent ou de même sexe, pour organiser leur vie commune."

facilitated since 2005, it still requires at least an hearing with a judge (instead of two before 2005). Some institutional features distinguish a pacs from a marriage : it is a private contract and not a public institution as marriage. So it is privately contracted at the court, and not publicly at the town hall. The pacs is not considered as a stepping stone in the formation of a family : so it does not entitle couples for joint adoption nor survival benefit in case of death. It does not open the possibility to ask for citizenship. In case of death, a pacsed partner is not necessarily the heir of the deceased partner : a testament is needed and inheritance were taxed differently. While married couples could join their income for income taxation since the date of marriage, pacsed couples had to wait for three years before filling jointly one tax return.

The pacs has been modified over time. The ban to collect data on pacsed persons was lifted in 2004, denoting that the pacs got more recognized as more and more couples, including different sex couples, opted for the pacs. In 2005, the three years delay for joint income taxation of pacsed couples was suppressed. Leturcq (2011b) shows that it encouraged couples to contract a pacs. The largest change occurred in 2006 : the law was modified to clarify the right and duties of pacsed partners. It also included a shift from joint to separate property of assets by default. In 2007, the taxation on inheritance between married spouses or pacsed partners were modified and made similar (but a testament is still required to designate the pacsed partner as the heir). So today, the main differences between the pacs and the marriage are the cost of separation, the possibility to adopt a child jointly, the lack of survivor benefit, the right to citizenship, and the pacs is still contracted in a court. Moreover, since 2007, the pacs is mentioned on birth certificates.

As denoted by Festy (2001), it was difficult to assess the pacs during its first years. It seemed to be more popular than in the Netherlands, but the lack of data made it difficult to understand the reason of that relative success. But the number of pacs contracted kept increasing both for same sex couples and different sex couples (Car-

rasco, 2007). As the rate of increase is larger for different sex couples, the proportion of the same couples among pacsed couples decreased over time. 5% of pacsed couples are same-sex couples in 2009, the proportion was 25% in 2000. Micro data on pacsed couples are still not available. However, the analysis of data of a matched data set of tax returns and labour force survey (*Enquête revenus fiscaux*) indicates that pacsed couples are more educated, have less children than married patners (Davie, 2011).

To conclude, the distinction between marriage and cohabitation has been lowered over time. The pacs was created as an intermediary contract between cohabitation and marriage. But it has been modified and it is now closer to marriage. But it is still a different contract, especially because of lower costs of separation, which are considered in the economic literature as the corner stone of the difference between cohabitation and marriage. It raises the question of the horizontal differentiation of contracts and the substitutability of the two marital contracts.

The transition from pacs to marriage could not be studied using the data on dissolution of pacs provided by the Ministry of Justice because transition from pacs to marriage were not observed before 2007. [4]

3 Links between marriage and pacs

3.1 Related literature : the economics of marital contracts

The economic literature on marriage has long ignored marital contracts. Since the seminal work by Becker, the literature has focused on couples : the theory of marriage

4. When contracting a marriage, the pacs is automatically dissolved. So partners did not have to mentioned to the court that they were not pacsed anymore after a marriage. Until 2007, vital statistics (birth certificate) were not matched with data on pacsed partners. As a consequence, the dissolution following the marriage of one partner is unknown for the Ministry of Justice. In 2007, vital statistics were matched to birth certificate mentioning marriage and the data set on pacs dissolution has been updated : but all broken pacsed because of a marriage were attributed to 2007. As a consequence, the transition from pacs to marriage is not observed, and it won't be observed until some survey reconstruct the marital life of partners.

is either a theory of matching (Becker, 1973, 1974) or a theory of household formation (Becker, 1981). But the development of cohabitation and the increase in divorce rates raised new issues : for example, link between marital instability and length of pre-marital cohabitation (Brien, Lillard, and Stern, 2006; Reinhold, 2010), the cause of increasing divorce rate (impact of divorce laws : Wolfers (2006); Friedberg (1998)) and the consequences on investment in capital specific goods, such as children (Stevenson, 2007; Drewianka, 2008).

The literature considers that couples can choose among two possibilities : cohabitation and marriage. The marriage is considered as a more committing relationship because it is more costly to dissolve. Some studies have considered marriage and cohabitation in a static framework. They are based on the theory of cooperative game and they insist on marriage as a commitment device (Matouschek and Rasul, 2008; Cigno, 2009). The idea is that marriage induces cooperation by increasing the cost of separation. Therefore, low quality couples use marriage in order to foster cooperation. This idea concludes that marriage is used by low quality couples to enforce commitment.

But the link between marriage and cohabitation is complicated by dynamic behavior. Static models fail to explain the development of cohabitation preceding marriage. Nowadays, a period of cohabitation tends to precede marriage (**?**). In Brien, Lillard, and Stern (2006) cohabitation is explained by incomplete information about the quality of the match. Before marring, couples try to find out how good the match is. Therefore, it is a necessary step in the household formation as partners discover new information about the quality of the match in a repeated game. The authors link the length of the cohabitation duration to marital instability : the longer the cohabitation period, the less clear the match quality is and the higher the probability of divorce after marriage. The underlying idea is that imperfect information justifies the two step dynamic of the formation of the household. This idea echoes the seminal work by Mead (1970) proposing a two step marriage, i.e. a marriage that includes a first step as a trial for

the couple.

In the model presented above, the marriage strengthens commitment between couples. But as marriage is considered as a long term partnership between two spouses, it highlights the willingness of the two partners to live together. As so, it can be considered as a signal toward to rest of the world (Bishop, 1984; Rowthorn, 2002; Leturcq, 2011a). But it can also signal to the other spouse one's willingness to form a household (Matouschek and Rasul, 2008).

The models consider only two types of marital arrangement : cohabitation and marriage. However, the supply of marital contracts has been extended during the period in many countries. Excluded Drewianka (2004), the literature has not studied the impact of the diversification of marital contracts on marital behavior. The understanding of potential links between marriage and pacs can be inspired by the literature on cohabitation and marriage. It can be understood as a less committing contract than marriage as it is less costly to dissolve, or as a different signal. But introducing a new type of marital contract has an ambiguous impact on the quality of the signal. Providing a kind of signal could improve the signalling of the couple, because it increases the supply of signals. But the quality of a signal depends on a universal agreement on the meaning of the contract. As it is a new contract, pacs can shape different meanings for pacsed couples (Rault, 2009).

As a consequence, the analysis of the use of marriage, pacs and cohabitation requires first to understand better the substitutability between pacs and marriage. This could make clearer how close the marital contracts are in the use of partners. At time t, for a couple : pacs can substitute to marriage or to cohabitation. But the dynamic could be more complex : pacs could be a long term substitute to marriage, keeping couples away from marriage and inducing foregone marriages, or it could be a short term substitute inducing a delay in marriage.

3.2 Theoretical approach

3.2.1 The potential links between marriage and pacs

The following analysis investigates the potential links between pacs and marriage, by comparing what could be the behavior of couples if the pacs exists compared to how they would have behaved, the pacs has not existed. I assume that the creation of pacs does not affect the couple formation, so that the number of couples is the same as what it would have been without the pacs.

If the pacs does not exist, couples can only cohabitate or be married. The creation of the pacs adds a third possibility in the couples' choices. As a consequence, at time t, it substitutes for cohabitation or for marriage. If it is a perfect substitute to marriage, the number of marriages is lower than what it would have been, but the number of legal unions is equal to what would have been the number of marriages. If it it is a perfect substitute to cohabitation : the number of marriages is not affected, and the number of legal unions is greater than what it would have been without pacs. The intermediate case would be that it is an unperfect substitute to both and the number of marriages is lower, but the number of legal unions is greater than the counterfactual number of marriages. If the counterfactual was observed, ie the number of marriages contracted at time t if the pacs has not been created, the substitution between pacs and marriage would be easily checked out. The observation of the joint evolution of the number of unions and marriage in fig. 3.2 suggests that the pacs is an unperfect substitute to marriage, because the total number of unions increases while the number of marriages decreases. But, the counterfactual number of marriages is not observed, so I am unable to give the underlying link between pacs and marriage.

The substitution between pacs and marriage indicates if they are close contracts for couples. The utility derived from marriage is heterogenous in the population because of different demographic features (such as children) or different match quality. If pacs

is a substitute for marriage then it affects those couples deriving better level of utility from marriage than cohabiting couples. If it is a substitute to cohabitation it affects those deriving from marriage lower level of utility. As a consequence, substitution to marriage indicates a low horizontal differentiation between contracts.

Utility derived from marriage can change over the life cycle (change in income, professional mobility, children, imperfect information on the match quality as in Brien, Lillard, and Stern (2006)) : attitudes toward marriage and pacs can also changed over the life cycle. As a consequence, the links between pacs and marriage have to be considered in a dynamic framework.

If the pacs does not exist, there are only two types of couples : only cohabiting couples (type 1 couples) or couples cohabiting first (even if the cohabitation period is very short) and getting married after a while (type 2 couples). But if the pacs is made available, four dynamics can be considered : only cohabiting couples ; cohabitation and then pacs ; cohabitation, pacs and marriage or cohabitation followed by marriage. The link between marriage and pacs depends on which type of couples alter their behavior. If pacsed couples would have been only cohabiting couples (type 1), the impact of pacs on marriage is very limited. It modifies the number of marriage contracted if couples, once pacsed, turn their mind toward marriage. Direct transition from cohabitation to marriage without pacs for type 1 couples are unlikely as it would violate the independence toward irrelevant alternatives assumption. On the contrary, if pacsed couples would have been type 2 couples, the links between marriage and pacs are more complex. A couple would have experienced a cohabitation spell before getting married can be affected by the pacs. If the new dynamic becomes cohabitation and then pacs, then the pacs can be considered as a long term substitute to marriage, inducing foregone marriage. The number of marriages is lower than what it would have been without the pacs, but the total number of legal unions is the same as the number of would-be marriages. The dynamic could also include a pacs spell between the cohabitation spell

and the marriage spell. If the pacs replaces the cohabitation spell, without affecting the marriage date, then the pacs can be considered as a short term substitute to cohabitation and it has no effect on marriage. On the contrary, if it affects the marriage spell, the pacs induces a delay in marriage, with couples postponing their marriage. So it does not decrease the number of marriages over the life cycle, but it increases the number of unions contracted during the life cycle and it changes marriage rates over the life cycle.

The different *scenarii* proposed above show that the observation of marital behavior indicates if pacs and marriage are close substitute of not. Long term substitution to marriage indicates that there is no horizontal differentiation between contracts and they are competing marital contracts. On the contrary, short term substitution suggests that the utility derives from marital contracts evolves over time and pacs and marriage are competing for some part of the life. The lack of substitution points out that the horizontal differentiation between contracts is important.

From the discussion above, the substitution between pacs and marriage can be analyzed by a measure of the age an individual get married (the tempo component) and a measure indicating if individual eventually marry or not (the quantum component). Both are features of the cumulative distribution of the age at marriage.

3.2.2 Period and cohort approach of tempo and quantum components

An important stream in the demographic literature attempts to disentangle in the observed decreasing marriage rate what comes from an increasing proportion of the population remaining unmarried their entire life from what comes from a part of population postponing marriage to older ages (Goldstein and Kenney, 2001). The *quantum* of marriage describes the number of ever married individuals and the *tempo* describes the age the marriage is contracted. The main issue in this stream of the demographic

literature is : how many times an individual is going to experience a certain event (here : marriage) in her life ? The cohort-based approach consists in observing the cohort during its entire life-cycle and counting the number of unmarried individuals to characterize the quantum of marriage. The problem is that this approach prevents from analyzing recent trends in marital behavior. The period-based approach is more popular as it permits the analysis of recent trends. The quantum is measured by the total marriage rate. [5] It is merely defined as the proportion of marriages that would be observed in a fictitious cohort experiencing at all ages the age marriage rates observed during the period. The problem is that this indicator is biased if individuals postpone their marriage. A bunch of papers attempt to extend the adjustment proposed by Bongaarts and Feeney (1998). The adjustment is based on the observed evolution of the tempo of marriage, measured by the evolution of the mean age at marriage.

The two approaches answer different questions : the *quantum* of marriage for a given cohort is measured at the end of the life and describes the life of a cohort, that experienced different periods, while the period approach measures the *quantum* for a fictitious cohort and has to be read as an indicator of the social environnement at a given period.

The measure of the impact of pacs on marriage decisions is prone to another problem : the observed period is still a transition period. Three periods can be distinguished. Before the introduction of pacs, no cohort is affected by pacs. So the evolution of the number of marriages is explained by changes in the age structure of population and changes in the rates of marriage at different ages. During the transition period, the pacs is introduced at time t, so it affects different cohorts at different ages. Therefore, some cohorts are affected although part of the cohort is already married. Only the unmarried couples from this cohort are affected. But cohorts are not affected at the same age, meaning that the part of the cohort which is affected is different for

5. The total marriage rate is an adaptation to marriage of the total event rates, which is the mostly used for the analysis of fertility.

each cohort. If there is some substitution between marriage and pacs, the introduction of pacs modifies the composition of unmarried couples at age a for a cohort attaining the age of a after the pacs is created compare to a cohort attaining the same age before the pacs is created. After the transition period, all cohorts experienced the choice between pacs, cohabitation and marriage at all ages of their marital life. The 2000-2009 period is clearly a transition period, as the marital life cycle varies according to the definition between 18 and 50 or 18 and 60. As a consequence, the transition period challenges the *quantum* analysis. Indeed, period-based indicators rely on the extrapolation of old cohorts behavior on young cohort behavior, assuming that *tempo* changes are independent on cohorts. This statement can not be assessed since changes can follow the introduction of pacs. The change of the composition of the population also challenges the interpretation of period-based indicators of the *tempo* of marriage such as the mean age at marriage.

A cohort based approach seems more relevant. But, neither a cohort-based indicator of the *quantum* nor the mean age at marriage can be measured during the transition period, as the end of the marital life cycle is not observed for cohorts that started their marital life cycle after the introduction of pacs.

However, the cohort based analysis of the *tempo* of marriage is made possible using quantiles, as they feature the distribution of the age at marriage. The lowest quantile of the distribution of the age at first marriage are defined for recent cohorts. As a consequence, tempo changes can be detected if the quantiles of the distribution of the age at marriage changes across cohorts.

4 Period analysis : marriage trends

4.1 Data

Data on marriages come from Vital Statistics. They provide information on all marriages registered in France since 1965 : birth date of the spouses, marriage date, and some personal information such as matrimonial status. Data on population come from the census. Census data are collected almost every 7 years in France (1968, 1975, 1982, 1990, 1999, 2006)[6]. Census provide information of people according to the marital status, the age, the sex and diploma.

These data are the best to reconstruct cohorts, because they allow for the reconstruction of precise outflows of singles in the marriage at all ages, contrary to survey data. Therefore, they provide precise information on the quantiles of the distribution of the age at marriage.

The reconstruction of the outflows into marriage by cohorts requires some assumptions. Indeed, people face competing risks : they can die or move abroad before getting married in which case the marriage is not observed, and foreigners can move in France. Their marriage is observed if they marry in France but not otherwise. In order to construct the hazard rate of marriage, I need the at-risk of marriage population, i.e. singles. The survival of singles for a cohort is reconstructed across time by removing married individuals to the stock of singles observed at the beginning of the period thanks to census data. The difference between the reconstruction of remaining singles and the number of singles observed in the next wave of the census is explained by movers and deaths. I drop the difference uniformly from the number of singles reconstructed for each year between two waves of census.

Moreover, the marriage can be a repeated event over the life cycle. If the risk of

6. Since 2004, census is made continuously : 8% of the population is listed each year. 2006 stands for listed people between 2004 and 2009. Therefore, half the population is observed. The total numbers are imputed at the national level.

remarriage increases, the distribution of the age at marriage can not be compared across cohorts. This is easily removed by considering only first marriages. The age at marriage is the age attained in the year.

4.2 The long run evolution of marriage

The long run evolution of marriage presented in fig. 3.1 shows that marital trends change dramatically before the creation of pacs in 2000. The number of marriages increased in the late 60s before decreasing in the 1970s until the mid 1980s. It is still decreasing since then but at a lower rate. The number of marriages contracted per year is decreasing since 2000. However, the total number of legal unions outnumbers marriages. In 2009, the total number of legal unions is close to the highest level of marriages in 1968. As a consequence, it seems rather impossible that the pacs is a perfect substitute to marriage as the observed pattern of unions would have required a large increase in the marriage rates.

The level of the number of marriages can be explained by marriage rates and by the age structure of population. The structure by age of the population has changed over time (see fig. 3.3), and it could change the number of marriages as the marriage rates are not constant over ages. In order to detect if the changes are mostly explained by rates or population, I propose to decompose the evolution of marriages in a part explained by the evolution of the population compared to a reference date t_0 and a part resulting in the change in the marriage rates :

$$\begin{aligned} M(t) - M(t_0) &= \sum_a R_t(a)P_t(a) - \sum_a R_{t_0}(a)P_{t_0}(a) \\ &= \sum_a [R_t(a) - R_{t_0}(a)]P_t(a) + \sum_a R_{t_0}(a)[P_t(a) - P_{t_0}(a)] \end{aligned}$$

where $M(t)$ is the number of marriage at date t, $R_t(a)$ the rate of marriage at age

a at date t, $P_t(a)$ the population aged a at date t. The decomposition presented in fig.3.4 shows that the evolution of marriages mostly comes from the evolution of rates, although the number of marriages would have been lower if the population has not kept increasing over the period. During the mid 1990s, baby boomers leave the age of high marriage rates, inducing a decline in the evolution of marriages. After 2000, the decline in the number of contracted marriages is explained by marriage rates.

The hazard rates of marriage, defined as the number of marriage for 1000 individuals aged 15-65 years old in fig. 3.5 give a rather different picture : the evolution of hazard rates indicates that singles are less likely to contract a marriage. The hazard rate indicates the proportion of singles getting married during the year. As a consequence, it takes into account the at-risk population of getting married (i.e. singles) and not the whole population. It increased during the late 1960s and started decreasing in the early 1970s. It does not stop decreasing since then, but the slope is less steep since the mid 1980s. The hazard rate was higher for women than for men but it tends to be very similar since the mid 1980s, indicating that the decrease of the hazard rate was larger for women than for men. The large decrease in the 1970s reflects the decrease in the number of marriages observed in fig. 3.1. The increasing number of singles could participate to the decrease of the hazard rates after 1985. The difference between the male and female rates is explained by different numbers of singles, indicating that there was less single females then single men, denoting an unbalanced marriage market. This could be explained by women marrying older men and by men getting remarried to single women. However, the difference in the number of singles tend to decrease after 1985, explaining the convergence of hazard rates. Notice that while the number of marriage tend to decrease after the introduction of pacs, the hazard rates does not seem to evolve differently after. Nevertheless, the probability of contracting a union when single increases a lot after the introduction of the pacs.

4.3 Period indicators : Marriage rates and mean age

Total marriage rate The total marriage rate a year t gives the proportion of married people of a fictitious cohort at the end of the life, if it has at each age the marriage rate observed for this age during the year t[7]. Although it is often considered as a measure of the quantum of marriage, it is not adapted to measure the quantum of marriage in transition periods, as it tends to underestimate the quantum for real cohorts if couples delay their marriage. As a consequence, the decrease of the unadjusted TMR is the result of the decrease in the number of marriage and the increase in the delay of marriage. Yet, it is still an interesting indicator as it gives the marriage rate taking into account the age structure of the population. Fig.3.6 shows that it tends to decrease dramatically until the late 1980s and remains stable after. Partial TMR at specific ages can be computed. Instead of integrated over the life cycle, partial TMR are computed on a certain age range. The sum of partial TMR is equal to the TMR. Partial TMRs give a better insight of the evolution of marriage, as it permits to understand that the total TMR is the result of diverging dynamics. They are given in fig. 3.7. The large decline of the TMR in 1965-1986 is explained by the large decline of marriage before 24 for women and men, but also by the decline of marriage rates between 24-29 for men. Although the TMR seems stable after 1986, the stability is explained by a two-fold dynamic. Between 1986 and 2000, the marriage rates of women aged 24-39 and men aged 30-39 increased, compensating the decline of marriage rates of youths. After 2000, the marriage rates of women aged 24-29 starts declining, while it keeps declining for men aged 24-29 years old, but the slope is steeper. The marriage rates at 30-39 stop increasing and become stable after 2000. Marriage rates after 40 years old keep increasing and is not negligible for men, although it is very low for women. As a

7. It is given by

$$TMR_t = \sum_a \frac{M_t(a)}{P_t(a)}$$

where $M_t(a)$ is the number of marriage at age a during the year t, and $P_t(a)$ the population.

consequence, the two main changes after 2000 are affecting 25-39 years old individuals.

The age at first marriage : why does it increase ? The mean age at first marriage increased gradually since 1971 (fig 3.8). It can not be directly read as the sign that the couples delay their marriage because it is driven by two forces : the age structure of the population and the marriage rates at each age. It can be decomposed into the part explained by the population and the part explained by rates. Denoting $P_t(a)$ the population aged a at t, $R_t(a)$ the marriage rate of the population aged a at t ($R_t(a) = M_t(a)/P_t(a)$), $P_t = \sum_a P_t(a)$ the total population at t and R_t the marriage rate at t (at all ages, $R_t = M_t/P_t$), then the mean age can be written as :

$$\overline{X}_t = \sum_a \underbrace{\frac{P_t(a)}{P_t}}_{=n_t(a)} \underbrace{\frac{R_t(a)}{R_t}}_{=r_t(a)} a$$

As a consequence, the evolution of the mean age at first marriage can be written as :

$$\underbrace{\overline{X_t} - \overline{X_{t_0}}}_{\Delta\overline{X}} = \underbrace{\sum_a n_{t_0}(a)(r_t(a) - r_{t_0}(a))a}_{Sr} + \underbrace{\sum_a (n_t(a) - n_{t_0}(a))r_t(a)a}_{Sn}$$

The left part (Sr) of the equation gives how would have evolved the mean age at first marriage, if the population has stayed the same as in t_0. The right part (Sn) indicates what is explained by the evolution of the structure of the population. In the following, I group ages into 4 age groups.

Fig. 3.9 decomposes the evolution of the age at first marriage in Sr and Sn. It shows that while the evolution of rates explains the shape of the evolution of the age

at first marriage, the age structure of the population has compensated the decline in the age at first marriage that would have been more than 2 years lower for men in the early 70s. Since 1995, the mean age at first marriage would have increased more without the decline explained by the age structure of the population.

Fig. 3.10 decomposes the impact of rates and population on age at first marriage by age groups. The decrease in the age at first marriage before 1970 is explained by the increase of the number of young people less than 24. The increase in the age at first marriage due to changes in the age structure of population between 1970 and 1995 is mostly explained by the increase in the population aged 24-29 years old. It corresponds to the baby-boom cohorts. After 1980, the increase in the age of marriage is explained by the changes in the rates of marriage of older people aged 24-39 years old. The joint evolution of the number of 24-29 and 30-39 years old people and their marriage rates explains the increase in the age at first marriage.

There is no major disruption after 2000 in the evolution of the mean age at marriage. It is interesting to notice that the age of pacsed partners (different sex)[8] are similar to the age at first marriage, and are evolving the same way between 2001 and 2006. Today, the age at pacs is even greater. Although it is difficult to explain why the mean age at pacs is greater, it could be linked to what was observed on TMR : the partial TMRs of persons aged 25-39 tend to decrease are become stable, indicating that there might be some substitution between pacs and marriage at these ages.

The period analysis does not reveal large change in marriage rates and the age at first marriage after the pacs was created. However, a cohort analysis is more adapted to the study of a potential link of substitution between pacs and marriage.

8. Data of the age of pacsed partner come from Carrasco (2007) for 1999-2006. 2007-2009 is reconstructed using data of the mean age of different sex pacsed partners provided by the ministry of justice under the assumption that the mean age difference between men and women is constant and equal to 2.

5 Delayed marriages ? A cohort analysis

5.1 Detect delaying and foregone marriages : a quantile approach

As explained above, if the pacs affects the marriage decision, the pacs can be seen as either a long term substitute or a short term substitute to marriage.

If it is a long term substitute, it induces foregone marriages, meaning that part of the population is not going to get married during its life : the proportion of unmarried individuals at the end of their life time is greater than what it would have been the pacs has not been created. As it is measured at the end of the life (or at an high enough age to consider that it is very unlikely that the remaining unmarried part of the population is going to marry), it is defined at the cohort level.

If the pacs is a short term substitute to marriage, it induces that some couples delay their marriage because they decide to pacs first. It means that compared to another cohort, the probability to get married is lower at some ages but it increases afterward. At the end of the life, the proportion of unmarried individuals is the same for both cohorts.

As a consequence, delaying and foregone marriages can be detected analyzing the cumulative distribution function (CDF) of age at marriage for a cohort compared to its counterfactual. As for duration models, the basic assumption is that everybody is getting married at the end, but some are getting married very late, so the marriage is not observed because data are censored (either because of death or because end of the period of observation). A foregone marriage can be seen as a censored duration or as a delayed marriage after the death. So it is difficult, if not impossible, to estimate the part of foregone marriage up to a certain age. Before this age, a foregone marriages are difficult to distinguish from delayed marriages.

The analysis of delaying marriage is based on the definition of the quantile function,

conditional on the cohort. Let's consider two cohorts. The CDF of the age at marriage is F_0 for the older cohort and F_1 for the younger. The conditional quantile function defines delayed and foregone marriages :

1. Let's define a foregone marriage an unmarried individual at age $\overline{a}$. It means that $F_k(\overline{a}) = \tau_k \neq 1$. If there are more foregone marriages for the younger cohort, it is detected by $\tau_1 < \tau_0$. So, the existence of foregone marriages means that quantiles $q(\tau)$ for τ greater than τ_k are not defined. However, this measure requires the observation of the cohort at least up to the age $\overline{a}$.

2. Delayed marriages means that the younger cohorts marry later. Delaying at all ages means that F_1 is stochastic dominated by F_0. A pure delaying does not induce foregone marriages, so that $F_0(\overline{a}) = F_1(\overline{a}) = \overline{\tau}$. So all quantiles $q_k(\tau)$, for $\tau \leq \overline{\tau}$ are defined for both cohorts, with $q_1(\tau) > q_0(\tau)$.

3. If the delay is homogenous in the population, ie the delay for couples getting married young is the same as the delay for couples marrying late ($q_1(\tau) - q_0(\tau) = \delta, \forall \tau$), then this could be express a a location shift of the CDF. But if the delay is heterogenous in the population ($q_1(\tau) - q_0(\tau) = \delta(\tau)$), affecting only early marriage for example, then it could also be linked to a scale shift of the CDF.

The effect of cohort (cohort 1 rather than cohort 0) on the quantile of rank τ of the distribution is the quantile treatment effect (QTE) and it is measured by the distance $q_1(\tau) - q_0(\tau)$. As a consequence, an impact of pacs on the number of marriages and the timing of marriages could be detected with the evolution of quantiles by cohorts, as long as previous cohorts provide a good counterfactual to younger cohorts.

5.2 A cohort based approach

5.2.1 Reconstructing cohort

The analysis of the evolution of quantiles across cohorts requires the reconstruction of the cumulative distribution function of the age at marriage by cohort. A cohort is composed of all individuals born the same year, and the CDF gives how the cohort flows out to married status. As a consequence, I only consider the age at first marriage.

It is not possible to observe the age at first marriage for the whole cohort because individuals face competing risks : death and out-migration, that can occurs before marriage. As a consequence, the size of the observable at-risk population changes over time. Moreover, the size of the cohort is also modified by in-migration. In order to analyse the CDF of the age at first marriage, I need to fix the size of the cohort, contrary to the period analysis presented above. The following describes how I fix it.

The mis-specification of the cohort can leads to under/over estimate the flow in marriage. If the reference size is the size at the beginning of the marital life[9], then those who die before being married are labelled as unmarried at the end of the life. So it would lead to overestimate the number of foregone marriages, especially if the probability of dying tend to be bigger for ages such as the older cohorts are already married but not the younger cohorts. Moreover, this is also a problem as it increases the quantile at a given rank τ. But if the reference size of the cohort is the size at the last observation, then the size of the cohort tends to be underestimate, because dying married individuals are counted in flow in marriage but not in the cohort size. It could lead to a CDF greater than 1, which is obviously not a desired property.

So I consider that the cohort is composed of singles at the end of the period I

9. The minimal age to get married without the consent of the parents is 18 years old in France for both men and women since 1974. However, between 1974 and 2006, women could get married if they were between 15 and 18 years old with the consent of parents. It has been increased to 18 for women in 2006. Before 1974, the minimal age to get married without the consent of the parents was 21 years old for both men and women (since 1907), but women could married with the consent of the parents if they were more than 15 years old and men if they were more than 18 years old.

observe (age in 2009 or 60 years old) and individuals getting married during the period I observe. As a consequence, singles dying before marriage are not counted in the cohort size. When I do not observe the beginning of the marital life (i.e. cohorts before 1950 for women and before 1947 for men) the cohort size is given by the number of singles at the end of the period, added to those getting married during the period and to those that are married at the beginning of the period I observe. So individuals dying before getting married during the period and individual already dead before the beginning of the period of observation (married of not) are not counted in the cohort size. As a consequence, the cohort size is given by a restrictive definition of cohort, including the risk of death. In other words, data on marriage are not censored, except by the end of the period of observation.

The in-migration flows increase the cohort size, making it difficult to define a cohort including migration. As a consequence, I only consider the age at first marriage for French citizen. The citizenship is defined as the citizenship at the age of marriage, observed in the vital statistics. Naturalization could modify the size of the cohort. If naturalization occurs before marriage then the individuals is part of the cohort. The size of the reconstructed cohort is given in fig. 3.11. The main pattern of birth cohorts is preserved.

The problem raised by migrations prevents from analyzing the evolution of cohorts at a more precise geographic scale because the cohort size is more variable. For the precise determination of quantiles, an individual is said to be married at age X if she was over this age (in month) when marrying.

5.2.2 The evolution of marriage by cohort

The evolution of marriage rates is described by the density function (type 1 rate), the cumulative function and the hazard function (type 2 rates).

The evolution of marriage rates by cohort can be divided into 5 periods. The

evolution is similar for men and women, although I keep different cohorts as turning points for men and women to illustrate this evolution, as men tend to marry older than women. The main evolutions are presented on figures 3.12 and 3.14 for women. Hazard rates by cohorts are described in fig. 3.13 for men and fig. 3.15 for women.

For the cohorts born before 1951 (for men) and 1954 (for women), the marriage rate by age is stable : the density and the cumulative function are almost the same. Men and women tend to marry young : the density reaches a maximum at 22 for men and 20 for women : more than 30% of the cohort is already married the year men turn 22 and women turn 20. At 25, 77% of women born in 1948 are married. At 28, 76% of men born in 1945 are married. However, the hazard rate starts declining after 23 for men and 20 for women, indicating that remaining singles tend to marry less. It tends to indicate that the changes in marriage rates could be detected even on older cohorts. The taste for marriage may be heterogenous in the population : the first individuals changing their behavior toward marriage are those getting married later indicating that those getting married very early have a strong taste for marriage.

The marriage rates at early ages (before 26 for men and 24 for women) decline sharply for cohorts born in 1951-1962 and 1954-1963 for women. It increases for older ages, but not enough to compensate the decline : 17% of women born in 1963 are married at 20 years old, and 48% of them are married at 25 years old and 70% at 35, while 89% of the 1948 cohort was already married at 35. 15% of men born in 1961 are married at 22, 48% are married at 28 years old and 64% at 35, it was 85% of the cohort born in 1945. This decline is linked to a large decrease in the hazard rate up to 32 for men and 28 for women. The hazard rate does not get greater for younger cohorts at older ages. It means that remaining singles never tend to increase their marriage rate compared to older cohorts. Despite the large decrease, the marriage rates remain the highest at 19-20 years old for women, 22-23 for men.

The following period witnesses a shift in the marriage rates by age. While marriage

rates keep declining before 26 for men and 24 for women, they keep increasing after, inducing a shift in the age the marriage rate is the highest. For men born in 1968, the marriage rate is the highest at 26 and for women born in 1971, the marriage rate is the highest at 25 years old. However, the increase at older ages does not compensate the decrease at younger ages : 58% of women born in 1971 are married the year they turn 35, 53% of men born in 1968 are married at 35. The hazard rate keeps declining until 29 for men and 26 for women. Then it remains stable across periods : the hazard rate of marriage for younger cohort never exceeds the hazard rate for older cohort, whatever the age. For ages greater than 26 for women, the hazard rates is stable across cohort. It means that the proportion of unmarried women deciding to get married remains constant at older ages : the number of marriages at these ages increases, following the increase of singles due to the decrease at younger ages.

The marriage rates for women born between 1971 and 1975 are stable, while the marriage rate for men born in 1968-1976 keeps decreasing and shifting : the marriage rate is the highest at 27-28. The hazard rates of women are also stable, while they keep decreasing at all ages for men as a consequence of the declining number of marriages.

The marriage rates starts decreasing again for women born after 1975 and men born after 1976. 6% of men and 14% of women born in 1983 are married at 25. The hazard rates of marriage decreases for all ages for very young cohorts. This decrease might be interpreted as an effect of the pacs, but it is difficult to assess directly this link given the preceding evolution described above.

In addition to the shift in the mean age at marriage, the variance of the rates of marriage has increased a lot. For cohorts born in the 1940's, the sharpness of the density of marriage rates traduces the weight of social norms around marital habits. The decline of marriage rates has also diluted the age considered as normal to get married.

To conclude, two main evolutions has to be taken into account : the transition

starts with an increase in the variance of the age at first marriage. It is followed by a shift in the mean age at first marriage. The variance keeps increasing for recent cohorts. The following analysis attempts to see if there is a link between the recent evolution of cohorts and the creation of the pacs.

5.3 Empirical strategy

5.3.1 Defining the treatment

Estimating the impact of pacs on marriage requires the definition of treated units. The intuitive definition considers that an individual is treated if she is not married when the pacs is created. Thus, for a given cohort, some individuals are treated and some are not, depending if they are married when the pacs is created. Let's consider a given cohort C and let $a^p = t^p - C$ with t^p the date of the creation of the pacs, be the age attained by this cohort the year the pacs is created. Let a_i^0 be the age at first marriage in a world without pacs, and a_i^1 the age at first marriage in a world with pacs. The distribution of a_i^0 and a_i^1 are given by F^0 and F^1. The individual i is treated if she is not married when the pacs is created, ie if $a_i^0 > a^p$, therefore $T_i = \mathbb{1}\{a_i^0 > a^p\}$. As a consequence, the observed age at first marriage is $a_i = a_i^0 + T_i(a_i^1 - a_i^0)$.

When the pacs if created, $F^0(a^p) = \underline{\tau}$ individuals of this cohort are married. Therefore, if the pacs is created when $\underline{\tau}$*100% of the population is untreated, the determination of the first quantiles up to $q(\underline{\tau})$ are not affected by the pacs, because they are determined before the pacs is created. But higher quantiles are likely to be affected by the creation of the pacs. It could induce a distortion of the distribution of the age at first marriage for this cohort.

Let F be the observed distribution of the age at first marriage for this cohort. It can be denoted as

$$F(a) = \sum_i \mathbb{1}\{a_i \leq a\}$$

, that can be rewritten after a straightforward computation, in

$$F(a) = \underbrace{F^0(a^p)}_{=\underline{\tau}} + \sum_i \mathbb{1}\{a_i^1 \leq a\}\mathbb{1}\{a_i^0 > a^p\} \tag{5.1}$$

So, the distribution of the age at first marriage is affected as soon as $a > a^p$ and a_i^1 and a_i^0 such as $a \geq a_i^1 \geq a_i^0 > a^p$ do exist.

Therefore, the treatment could be defined at the cohort level : a cohort could be considered untreated for the first quantiles of the distribution up to $q(\underline{\tau})$ and treated for quantiles larger than $q(\underline{\tau})$. Denoting C the cohort and t^p the date of the creation of the pacs, $F_C(t-C)$ gives the number of married individual among the cohort C at the age $t^p - C$, when the pacs is created. So the treatment status of the cohort depends on which quantile is considered and it is given by

$$T_C(\tau) = \mathbb{1}\{F_C(t-C) < \tau\} \tag{5.2}$$

Fig. 3.16 illustrates the definition of the treatment status. As a consequence, a cohort can be untreated for the determination of a quantile but treated for the determination of another quantile. Treated and untreated cohorts for different quantiles are detailed in table 3.3 for men and table 3.2 for women. The treatment status of the cohort is directly derived from the more intuitive definition of the treatment at the individual level.

Notice that the composition of the unmarried population at a rank τ depends on when the cohort starts being treated. Indeed, let's consider two cohorts : the pacs is created when the cohort C_0 attains the rank in the distribution τ_0 and when the cohort C_1 attains the rank in the distribution τ_1 with $\tau_1 < \tau_0$ (the cohort 1 is younger). So, if there is some substitution between pacs and marriage, the composition of the unmarried population is different when the two cohorts attain the rank τ, because some

individuals in cohort C_0 got married between the age $q(\tau_1)$ and $q(\tau_0)$ but they would not have been married if the pacs has existed at that time. It means that the treatment effect at a given quantile is not likely to be constant across cohorts, because it affects different populations. This could be seen in eq. 5.1 : $F(a) \neq F^0(a) + \mathbb{1}\{a \geq a_p\}F^1(a)$.

5.3.2 A quantile regression approach : identification issues

A before-after estimation on quantiles

The conditional quantile function (CQF) can be written as

$$Q_{a_i}(\tau|C_i) = \alpha(\tau) + \delta_{C_i}(\tau) + \eta_{C_i}(\tau)T_{C_i}(\tau) \tag{5.3}$$

where a_i is the age at first marriage, C_i is the cohort the individual i belongs to and T_{C_i} indicates if the cohort has been treated for this quantile as given in eq. 5.2, $\delta_{C_i}(\tau)$ is the cohort effect for this quantile. $\eta_{C_i}(\tau)$ is the quantile treatment effect at rank τ, for a cohort C. This framework does not give any functional form for the effect of the cohort on the quantile and for the effect of the treatment on the quantile. However, this framework meets the standard identification problem that a cohort can not be observed both treated and untreated for a quantile, preventing the identification of $\delta_{C_i}(\tau)$ and $\eta_{C_i}(\tau)$ [10].

A simple difference identifies $\eta_{C_i}(\tau)$ if $\delta_{C_i}(\tau)$ is constant across cohorts. But $\delta_{C_i}(\tau) = \delta(\tau), \forall C_i$ imposes some stability on the repartition of the ages at first marriages because it imposes that the age such as $\tau * 100\%$ of the cohort is already married is constant across cohorts. It seems to be a strong assumption, as the previous part showed, except for cohorts born during the 1940's.

A standard difference in difference identifies the impact of treatment under restric-

10. The CQF can be written using the classic Rubin framework : $Q_{a_i}(\tau|C) = Q^{(1)}_{a_i}(\tau|C_i)T_i + Q^{(0)}_{a_i}(\tau|C_i)(1-T_i)$ with $Q^{(0)}_{a_i}(\tau|C_i) = \alpha(\tau) + \delta_{C_i}(\tau)$ and $Q^{(1)}_{a_i}(\tau|C_i) = \alpha(\tau) + \delta_{C_i}(\tau) + \eta_{C_i}(\tau)$

tive assumptions. Consider 3 cohorts, $C = 0$, $C = 1$ and $C = 2$. Only the last cohort, $C = 2$ is treated at rank τ, so that $T_{C=2}(\tau) = 1$ and $T_{C\neq 2}(\tau) = 1$. The difference in difference on quantiles identifies (with a simplified writing) :

$$\begin{aligned} & [Q(\tau|C=2) - Q(\tau|C=1)] - [Q(\tau|C=1) - Q(\tau|C=0)] \\ = \; & [\delta_{C=2}(\tau) + \eta_{C=2}(\tau) - \delta_{C=1}(\tau)] - [\delta_{C=1}(\tau) - \delta_{C=0}(\tau)] \\ = \; & \eta_{C=2}(\tau) \text{ if } [\delta_{C=2}(\tau) - \delta_{C=1}(\tau)] = [\delta_{C=1}(\tau) - \delta_{C=0}(\tau)] \end{aligned}$$

The identifying assumption $[\delta_{C=2}(\tau) - \delta_{C=1}(\tau)] = [\delta_{C=1}(\tau) - \delta_{C=0}(\tau)]$ is true if $\delta_C(\tau) = \delta(\tau) * C$ ie if the evolution of the quantile follows a linear trend. This assumption is strong as it assumes that the evolution of the quantile between $C = 1$ and $C = 0$ describes well the evolution between $C = 2$ and $C = 1$. It does not allow for non linear evolution of quantiles such as a period of stability of the age at marriage following a shift. Under this assumption, the estimator is a simple before-after estimator, figure 3.17 sums up the identification of the quantile treatment effect in that case.

Despite its simplicity, the analysis of non parametric quantiles in figure 3.19 for men and figure 3.21 for women shows that the linear trend assumption is not a bad approximation for cohort born after 1960 for low ($\tau \in [5, 25]$) and medium ($\tau \in [30, 50]$) ranks, and for cohort born after 1955 for higher ranks ($\tau \in [55, 75]$).

Notice that the quantile treatment effect $\eta_{C_i}(\tau)$ is not necessarily constant across cohorts. An important problem is that if there is substitution between pacs and marriage, the introduction of pacs changes the composition of the unmarried population at a given age. So, the longer the period between the introduction of pacs and the age the cohort attains when $\tau * 100\%$ is married is, the more affected the cohort is. I take this possibility into account including a trend for treated units.

The estimated equation is

$$Q_{a_i}(\tau|C_i) = \alpha(\tau) + \delta(\tau)C_i + [\eta_0(\tau) + \eta_1(\tau)C_i]T_i(\tau) \equiv z_i'\beta(\tau) \tag{5.4}$$

where T_i is a dummy indicating if the individual belongs to a treated cohort and C_i is a continuous variable for the cohort. The vector of parameters $\beta(\tau)$ is estimated using quantile regressions. Koenker and Bassett (1978) have showed that $\beta(\tau)$ can be estimated by minimizing in β :

$$\frac{1}{n}\sum_{k=1}^{n}\rho_\tau(a_i - z'\beta)$$

where a_i is the age at first marriage for individual i and $\rho_\tau(u)$ is the objective function such as :

$$\rho_\tau(u) = \begin{cases} \tau \times u, & \text{for } u \geq 0 \\ (1-\tau) \times u, & \text{for } u < 0 \end{cases}$$

The variance of the conditional quantile $Q_{a_i}(\tau|C_i)$ is given by $V(q_\tau) = \frac{\tau(1-\tau)}{f^2(q_\tau)}$ where f is the density of the outcome (a_t). The estimation of the variance requires the non parametric estimation of the density function f. In order to avoid such estimation, the standard errors of the coefficients are estimated by bootstrap.

The CQF is censored as the quantile is not necessarily defined for youngest cohorts. The last defined quantile for each cohort is indicated in table 3.3 for men and 3.2 for women. I estimate the impact of treatment on uncensored quantiles, so the composition of cohorts used for the estimation changes depending on the quantile. An estimation including censored quantiles would be a nice extension.

Any change in the trend of the CQF after the pacs is created is going to be

interpreted as a treatment effect. But it could also be explained by a change in the trend if a change is occurring at the same time of the introduction of pacs. I introduce in the estimation a potential concave impact of the cohort by the introduction of a trend and a quadratic trend in cohort. So it is difficult to have a causal interpretation of the results, because causality stems from the trend assumption which is a stringent assumption.

Moreover, the quantile treatment effect (QTE) is not identified if cohort fixed effect are integrated in the model. But interquantile regressions can provide an estimation of the QTE when cohort fixed effects are included.

A DiD model using interquantile distances

Let's consider the most general model for the conditional quantile function, as given by the eq. 5.3 :

$$Q_{a_i}(\tau|C_i) = \alpha(\tau) + \delta_{C_i}(\tau) + \eta_{C_i}(\tau)T_i(\tau)$$

The evolution of the CQF could be due to some cohort fixed effects across quantiles. Including cohort fixed effects is important if some large changes are affecting all individuals of a cohort and modifying their behavior towards marriage, in a sense which is not taken into account by the linearity of the CQF in the cohort. Such changes could be a rise in education attainment, a change in the minimal required age to get married. However, a cohort fixed effect affect equally all quantiles, inducing a location shift of the conditional cumulative distribution function. Most large changes are not likely to affect all quantiles the same way, but could affect part of the distribution. It could be included in the cohort effect, written as a part depending on τ and a fixed part :

$$\delta_{C_i}(\tau) = \gamma_{C_i}(\tau) + \mu_{C_i}$$

The before-after estimation presented above does not identify the treatment effect $\eta_{C_i}(\tau)$ if cohort fixed effects are included, even if the impact of cohort on quantile is linear with $\gamma_{C_i}(\tau) = \gamma(\tau)C_i$. Indeed :

$$\begin{aligned} & [Q(\tau|C=2) - Q(\tau|C=1)] - [Q(\tau|C=1) - Q(\tau|C=0)] \\ = \; & [\gamma(\tau) * 2 + \mu_2 + \eta_{C=2}(\tau) - \gamma(\tau) - \mu_1] - [\gamma(\tau) + \mu_1 - \mu_0] \\ = \; & \eta_{C=2}(\tau) + [\mu_2 - 2\mu_1 + \mu_0] \end{aligned}$$

The identification strategy presented below is based on pair wise comparison of quantiles, so it enables to drop cohort fixed effects that are common to the two quantiles and thus allowing for fixed effect for part of the distribution. If cohort fixed effects are assumed to affect locally the distribution, a comparison of close quantiles is suffisant to drop the cohort fixed effects.

The interquantile distance can be used to identify the QTE in that case. Let's consider two quantiles defined at τ_0 and τ_1, with $\tau_1 > \tau_0$. The interquantile distance is given by :

$$\begin{aligned} Q_{a_i}(\tau_1|C_i) - Q_{a_i}(\tau_0|C_i) &= [\alpha(\tau_1) + \gamma_{C_i}(\tau_1) + \mu_{C_i} + \eta_{C_i}(\tau_1)T_i(\tau_1)] \\ &\quad -[\alpha(\tau_0) + \gamma_{C_i}(\tau_0) + \mu_{C_i} + \eta_{C_i}(\tau_0)T_i(\tau_0)] \\ &= [\alpha(\tau_1) - \alpha(\tau_0)] + [\gamma_{C_i}(\tau_1) - \gamma_{C_i}(\tau_0)] \\ &\quad +[\eta_{C_i}(\tau_1)T_i(\tau_1) - \eta_{C_i}(\tau_0)T_i(\tau_0)] \end{aligned}$$

In the following, let's define $\Delta_{C_i}(\tau_0, \tau_1) = Q_{a_i}(\tau_1|C_i) - Q_{a_i}(\tau_0|C_i)$ Let's assume that there are two cohorts, $C = 1$ and $C = 2$. The former is not treated for τ_0 and τ_1, but the latter is treated for τ_1 but not for τ_0. As a consequence :

$$\Delta_{C=2}(\tau_0,\tau_1) - \Delta_{C=1}(\tau_0,\tau_1) = [\gamma_{C=2}(\tau_1) - \gamma_{C=2}(\tau_0)] - [\gamma_{C=1}(\tau_1) - \gamma_{C=1}(\tau_0)] + \eta_{C=2}(\tau_1)$$

Therefore, $\eta_{C=2}(\tau_1)$ is identified if $[\gamma_{C=2}(\tau_1) - \gamma_{C=2}(\tau_0)] = [\gamma_{C=1}(\tau_1) - \gamma_{C=1}(\tau_0)]$. So it is identified if $\gamma_C(\tau)$ is constant across cohorts, which is a strong assumption. But it is not identified under an assumption of linearity such as $\gamma_{C_i}(\tau) = \gamma(\tau) * C_i$. Because in that case :

$$\Delta_{C=2}(\tau_0,\tau_1) - \Delta_{C=1}(\tau_0,\tau_1) \quad = \quad \gamma(\tau_1) - \gamma(\tau_0) + \eta_{C=1}(\tau_1)$$

As a consequence, $\eta_{C=2}(\tau_1)$ is identified by difference in difference in difference, considering a third cohort $C = 0$ which is not treated both at τ_1 and at τ_0. It comes :

$$\begin{aligned} & [\Delta_{C=2}(\tau_0,\tau_1) - \Delta_{C=1}(\tau_0,\tau_1)] - [\Delta_{C=1}(\tau_0,\tau_1) - \Delta_{C=0}(\tau_0,\tau_1)] \\ = \quad & [\gamma(\tau_1) - \gamma(\tau_0) + \eta_{C=1}(\tau_1)] - [\gamma(\tau_1) - \gamma(\tau_0)] \\ = \quad & \eta_{C=1}(\tau_1) \end{aligned}$$

This method requires untreated cohorts and cohorts only treated for τ_1.

Comparing the treated cohort at τ_1 ($C = 2$) to a cohort $C = 3$ which is treated both at τ_0 and τ_1 gives an estimation of :

$$\Delta_{C=3}(\tau_0,\tau_1) - \Delta_{C=2}(\tau_0,\tau_1) \quad = \quad \gamma(\tau_1) - \gamma(\tau_0) + \eta_{C=2}(\tau_1) - \eta_{C=3}(\tau_1) + \eta_{C=3}(\tau_0)$$

In that case, comparing to a third cohort which is not treated both in τ_1 and τ_0 leads to the identification of $\eta_{C=2}(\tau_1) - \eta_{C=3}(\tau_1) + \eta_{C=3}(\tau_0)$ but neither the QTE at

τ_0, $\eta_{C=3}(\tau_0)$ nor the QTEs at τ_1.

If the QTE at τ_1 is assumed to be linear in the cohort : $\eta_C(\tau) = \eta_0(\tau) + \eta_1(\tau)C$, $\eta_{C=2}(\tau_1) - \eta_{C=3}(\tau_1) = \eta_1(\tau_1)$, which is identified by the comparison of untreated cohorts to a cohort treated only in τ_1.

As a consequence, under the assumption that the QTE is linear and considering a continuum of cohorts such that $T(\tau_0)$ and $T(\tau_1)$ are not always equal, the QTE is identified in the model :

$$\Delta_{C_i}(\tau_0, \tau_1) = a(\tau_0, \tau_1) + d(\tau_0, \tau_1)C_i + [\eta_0(\tau_1) + \eta_1(\tau_1)C_i]T_i(\tau_1) + [\eta_0(\tau_0) + \eta_1(\tau_0)C_i]T_i(\tau_0) \tag{5.5}$$

As for the difference in difference estimation, the trend in the QTE takes into account the evolution of the composition of the unmarried population. The schema 3.18 illustrates the identification.

The identification relies heavily on the assumption of continuity : the pacs was not created, the interquantile distance $d(\tau_0, \tau_1)$ would have evolved the same way.

$T(\tau_0)$ is not necessarily equal to $T(\tau_1)$. Of course, $T(\tau_0)$ implies $T(\tau_1)$ because if the cohort is treated for a low quantile, it is also treated for a higher quantile. But the contrary is not necessarily true, especially because the pacs was created at a given period, affecting all cohorts at different ages. However, if the compared quantiles are very close, $T(\tau_0) \approx T(\tau_1)$, challenging the estimation.

The estimation of the interquantile distance requires the joint estimation of two quantiles. The variance of the estimator requires the estimation of the variance of the estimator for each quantiles and their covariance. Therefore, the variance is estimated by bootstrap.

5.4 Results

5.4.1 Evolution of quantiles

The evolution of quantiles is given by fig. 3.21 and 3.22 for women and fig. 3.19 and 3.20 for men. The evolution is similar for both men and women. All quantiles are stable for the cohorts born in the 1950s. The last quantiles (higher than q40) increase for older cohorts born in the 1950s, while the lower quantiles remain stable. Lower quantiles start increasing for cohorts born in the 1960s. It tends to show that social changes do not affect all the population at the same time. While part of the population keeps marrying with the same pattern, another part of the population changes its marital behavior. The overall evolution of quantiles denotes the increasing delay of the first marriage as all quantiles increase across cohorts. This delay can be observed at all ranks of the distribution : even the lowest quantile increases with cohort. But the quantiles also denote the increasing variance in the age of marriage, meaning that the social norms around marriage are diluting. The highest quantiles increase sharply with cohorts, denoting the increasing number of foregone marriages.

No disruption in the evolution of quantiles can be observed after the creation of the pacs, except that lower quantiles tend to increase at a lower rate.

The interquantile distance compares the evolution of quantiles τ_1 to a baseline quantile τ_0. It means that it compares, for a given cohort, the marital behavior of the population getting married early to those getting married older. An increasing distance between quantiles indicates the behavior toward marriage is not changing at the same rate for different populations. Interquantile distances are presented in fig. 3.24 for women and in fig. 3.23 for men. I take as baseline quantiles Q5, Q10 and Q20. The labels T1 (resp. T0) indicates when the higher τ_1 (resp. lower τ_0) compared quantile is defined after the creation of pacs. What ever the baseline quantile, the

interquantile distance increases over time, especially for cohorts born after 1960. The slope is larger for higher quantiles, denoting the increasing variance of the age at first marriage across cohorts. The distance between Q5 and Q10 is very stable across cohorts. As a consequence, the interquantile distance of other quantiles to Q10 is very similar to the distance to Q5. Although any clear change can not be detected after the introduction of pacs for men, the interquantile distance between highest quantiles and Q10 or Q20 is increasing at a higher rate after the introduction of pacs for women. Notice that the evolution is not necessarily the same for men and women as men and women do not marry at the same age.

5.4.2 Before-After model : quantile regressions

I propose different specifications to estimate eq.5.4. The first one only includes a constant and a trend for cohort. The second introduces a dummy for the treatment of the creation of the pacs as defined in eq.5.2 and a trend for cohort after the creation of pacs, to take into account the change in the composition of the unmarried population. I also test an alternative definition of the treatment, that defines as treated a cohort for which the quantile was defined after 2005 and not 2000. This is to take into account the spread of information on the pacs across cohorts and the large increase in the number of pacs contracted after 2005 because of the reform of income taxation of pacsed couples. I then run the same estimation by adding a quadratic trend on cohorts. The same specifications are run on two set of cohorts : the first one only includes cohorts born after 1960, the second one adds 1955-1960 cohorts. The impact of the creation of pacs is evaluated at 12 ranks of the distribution of the age at marriage, for every five percentiles between Q5 and Q60. I only show results for Q5, Q20 and Q50, for the first set of cohorts. Indeed, as indicated above, the increase started for cohorts born after 1960 for lowest quantiles. Complete results are available in a separate appendix.

As explained above, the treatment status of cohorts depends on the studied quan-

tile : table 3.3 for men and table 3.2 for women give the treatment status for each cohort depending on the quantile. Tables 3.4 to 3.9 gives the results of the quantile regressions. The coefficient on cohort is stable across specifications. Adding a quadratic trend seems relevant as it is significant in many specifications. The treatment status is significant for lower quantiles but not for higher quantiles. Surprisingly, the treatment status is negative for lower quantile, meaning that under the assumption of constant trend across cohort, the treatment tend to lower the age at marriage for those getting married early. This effect seems surprising as it is unexpected. However, the total impact of the treatment has to be computed in order to discuss the impact of the creation of the pacs. The second definition of treatment is not significant. As a consequence, any changes in the timing of marriage have to be detected before 2005. My favorite specification includes a trend and a quadratic trend in cohort, a dummy for treatment in 2000 and a trend for treated cohorts (column (6))

The coefficients of the quantile regressions are plotted in figure 3.26 for men and figure 3.25 for women. Not surprisingly, the coefficients on cohort are increasing over quantiles, meaning higher quantiles tend to vary more with cohort than lower quantiles. The quadratic trend is significant for intermediate quantiles, although it is slightly significant for men. The coefficients on treatment show interesting pattern. The dummy for treated cohort is positive and significant, while the trend for cohort after the treatment is negative for lower quantiles. For intermediate quantiles, the signs are the contrary.

The total impact of treatment for a given cohort can be reconstructed at each rank of the distribution with :

$$\hat{\eta}(\tau) = \hat{\eta}_1(\tau) * cohort + \hat{\eta}_0(\tau)$$

Fig. 3.29 for women and 3.30 for men reconstruct the impact of treatment for two cohorts. The cohort of females born in 1975 is affected after the 20^{th} percentile. The impact of pacs is not significant on the distribution of the age at marriage. However,

the cohort born in 1977 is affected since the 10^{th} percentile. Lowest quantiles are negatively affected : the age such as 10% of the 1977 cohort is married is 5 months lower than what it would have been without pacs. This result can be interpreted as a sign that the youngest cohort are affected negatively by the creation of pacs, meaning that they tend to marry younger than what they would have done the pacs was not created. It can also be interpreted as the sign that the identifying assumption is not likely to hold here, and that the lower quantiles of the distribution would have increased slower after 2000. This is the most likely interpretation, although the reason of the slow down for lowest quantiles is not clear. For men, the measured impact of pacs is never significant.

5.4.3 DiD model : interquantile regressions

The interquantile estimation are based on the idea that the baseline quantile estimated at rank τ_0 is similar to a control group, so the assumption is that distance between the treated group (ie the upper quantile, estimated at rank τ_1) would have evolved the same way as before the creation of the pacs. I observed in the previous part that the lower quantiles tend to increase at a smaller rate after the pacs is created. So the interquantile regression makes the implicit assumption that quantiles are jointly determined and that the upper quantiles estimated at rank τ_1 would have also increased at a lower rate. Interquantile regressions drop features of the distribution common to different quantiles. I take different baseline quantiles : Q5, Q10 and Q20. But the comparison of close quantiles suffers an identification problem, because for close quantiles, the treatement status of the cohort for at the rank of the distribution τ_1 is almost the same as the treatment status at the rank of the distribution τ_0. As a consequence, I test different specifications. The first includes a trend on cohort, the second adds a dummy and a trend on the cohort for the treatment status of the cohort at the rank τ_1. The third adds a dummy and a trend on cohort for treatment status at

the rank τ_0. The last three columns add a quadratic trend on cohort. I also test two set of cohorts : cohorts born after 1960 and cohorts born after 1955 (only results on cohort born after 1960 are presented).

I present only a few interquantile regressions, for selected ranks in tables 3.10 to 3.21. The coefficient on cohort is stable and significant, while the quadratic trend is significant for the comparison of the lowest quantiles (Q5-Q10, Q5-Q20, Q10-Q20). When the treatment status of the quantile estimated at τ_0 is not included, the coefficient for the treatment status of the cohort for the quantile estimated at τ_1 is significant when comparing the lowest quantile (Q10), indicating that the interquantile distance tend to increase across cohorts after the creation of the pacs. But the treatment status is not significant for the comparison with higher quantile (Q50). This could be due to the fact that the comparison with high quantile reduces drastically the number of cohorts included in the regression, as the high quantile are only defined for older cohorts, but also because older cohort are less affected by the pacs. As noted above, the treatment status of the cohort for the quantile estimated in τ_0 is very close to the treatment status of the cohort for the quantile estimated at τ_1. As a consequence, including the treatment status in the regression increases the standard error and the estimations are not significant anymore. In the following representations I keep results of specifications including the treatment status for the quantile computed in τ_1 but not for the quantile computed in τ_0. Dropping the treatment status for the quantile computed in τ_0 tend to bias the estimation. Indeed, if the quantile at τ_0 tends to increase because of treatment, and if this increase is not taken into account then I tend to overestimate the treatment effect, providing that the impact is positive and significant on the lower compared quantile, or to underestimate the treatment effect if the impact is negative. The estimation in the previous part tend to show that the evolution is either negative (Q5) or not significant so it tends to underestimate the impact. Moreover, notice that lower quantiles tend to take more time to react to social changes : while the highest

quantile of the distribution of the age at marriage grew very fast for cohorts born in the 1950s, the lowest quantiles started increasing for cohorts born in the 1960s. Maybe this is due to the fact that population likely to marry early might have a higher taste for marriage. As a consequence, it might be possible to observe some distortions in the interquantile distance if the adjustment is not as fast for lower quantiles than for higher quantiles. This distortion could indicate an impact of the creation of pacs on the age at first marriage. Notice that if the conditions are verified, the results for the treatment effect should be the same, independent of the baseline.

Fig. 3.27 and 3.28 gives the impact of coefficients at each rank of the distribution. The coefficient of cohort is increasing and significant, indicating that the interquantile distance increases across cohorts. The coefficient on the quadratic trend is negative, so the impact of the cohort on the quantile is concave. The parameters of interest are given by the coefficient of the dummy variable on treatment and the trend on cohorts after treatment. Both coefficients are significant for lower quantiles, whatever the baseline quantile. The coefficient on the dummy is negative, while the coefficient of the trend is positive. The sign of the total impact have to be derived, but the evolution across cohorts can be directly interpreted as it is given by the trend on cohorts after the pacs. The positive coefficient indicates that it tends to increase after the pacs is created, especially for intermediate quantiles, whatever the baseline quantile. Notice that the comparison of the three baseline quantiles give similar results.

Fig. 3.29 give the estimated impact of the creation of the pacs on the distribution in the age at marriage for the female cohorts born in 1975 and 1977 and fig. 3.30 for male cohorts born in 1973 and 1976. The impact is not significant for older cohorts but it is significant and positive for intermediate quantiles for younger cohorts. It indicates that the age at marriage increased with approximatively 10 months (depending on the baseline quantile) for the rank $\tau_1 = 0.3$, and it increased with approximatively 15 months (depending on the baseline quantile) for the rank $\tau_1 = 0.35$ for women. For

men, it increased with 10 months at rank 0.25 and with 15 months at rank 0.3. The total impact of the treatment estimated by interquantile regressions is very similar to the estimation using quantile regressions.

5.4.4 Interpretation

The results highlight two main effects. First, the increase of the age at first marriage for lower percentiles has slowed down after the creation of the pacs. However, the causal interpretation of the impact of the creation of pacs relies on strong assumptions : any social changes occurring at the same time is interpreted as an impact of the creation of the pacs. So this result could also be understood as a sign that the conditional quantile functions would have slow down, and it is detected on lower quantile because people likely to marry early do not adapt their marital behavior to the creation of the pacs. So lower quantiles could be interpreted as baseline quantiles : in that case, the assumption that quantiles of the CDF are jointly determines implies that the increase of higher quantiles would have also slowed down. As a consequence, the interquantile regressions indicate that people getting married older (intermediate quantiles) have delayed their marriage, leading to an increase of the quantile. But this interpretation relies also on strong parametric assumptions on the interquantile distance. Notice that a decline in the quantiles defined at higher ranks is not observed : so the increase in the quantiles at intermediate ranks does not reveal a delay because a pure delay should be detected with the estimation that the treatment increases quantiles for some ranks while it decreases for higher ranks.

So, if any, the impact of the creation of the pacs on the marital behavior of couples is not clear, meaning that the impact might be quite small. So it might mean that the pacs is contracted either by couples that would not get married anyway or during the cohabitation spell. Therefore, it reveals a demand for different marital contracts during the pre-marital period and an evolution over the life cycle of the use of marriage.

6 Conclusion

The paper attempts to analyze if the pacs is used as a substitute to marriage. The analysis is based on the idea that if the pacs is a substitute to marriage then it should change the timing of marriage either because the couple do not get married or because they get married later. The problem is that timing effects are difficult to measure on period data because classical indicators are not neutral to the tempo marriage. But a cohort analysis requires to wait for a long time before data on the age at first marriage are available for the complete cohort. However, the change in the timing of marriage can be observed in the cumulative distribution function of the age at marriage. Therefore, the idea is to check if the pacs has an impact on the timing of marriage by analyzing if the features of the CDF of the age at first marriage, by cohort, are modified after the creation of the pacs. So I propose to analyze the quantiles of the distribution of the age at marriage in order to detect changes in the timing of marriage after the creation of the pacs. I find a slightly significant change in the timing of marriage after the creation of pacs for intermediate quantile (Q25-Q30 for men, Q30-Q35 for women), for young cohorts (born after 1975 for women, 1973 for men). This change might be explained by the creation of pacs. As a consequence, if any, the impact of the creation of pacs on the timing of marriage is not very important.

This paper is still an on-going project that has to be completed with *Enquête Famille 2011*, a survey joint to the census. It will provide micro data and information on the household formation, including pacs and marriage.

7 Annexes

TABLE 3.1: Legal features of marital status in France

	Cohabitation	**Pacs**	**Marriage**
Income taxation	Separate	– Before 2005 : separate during 3 years, common after – After 2005 : common since the day the pacs is contracted	Common since the day the marriage is contracted
Inheritance	– Surviving partner has to be declared in the testimony – High tax rates : after a 1564eur allowance, tax rate of 60%	– Surviving partner has to be declared in the testimony – Since 2007 : No tax – Before 2007 : marginal tax rate of 40% until 15000eur, 50% after	– Surviving partner automatically inherits from the spouse – Since 2007 : No tax – Before 2007 : Taxed, but lower rates than pacsed partners
Assets sharing	No asset sharing, unless bought together	– Since 2006 : By default, the contract separates assets. But the type of contracts can be changed. – Before 2006 : Depends on the contract when the pacs is contracted.	By default, the contract separate assets bought before the marriage, but assets bought after the marriage are common (communauté de biens réduite aux acquêts). But the type of contracts can be changed (for separate or community of all assets.
Debts	No solidarity	Solidarity of debts linked to everyday life and housing	Solidarity of debts (but protection of the housing)
Adoption	No legal adoption by the partners (but one can adopt on its own)	No legal adoption by the partners (but one can adopt on its own)	Legal adoption authorized
Social protection	No common coverage	Common coverage allowed	Common coverage allowed
Survivor's pension	No	No	Yes
Citizenship	No citizenship	No citizenship, but being pacsed can be a relevant piece	Citizenship after 4 years
Break up	Unilateral or common. No cost, but no alimony nor damages pension	Unilateral or common. No great costs : letter to the court. But no alimony, possibility of damages pension	Common. Divorce costs (obligation to be dissolved by a judge). Possibility of alimonies and damages pension

Legal features at the end of 2009

7.1 Period analysis

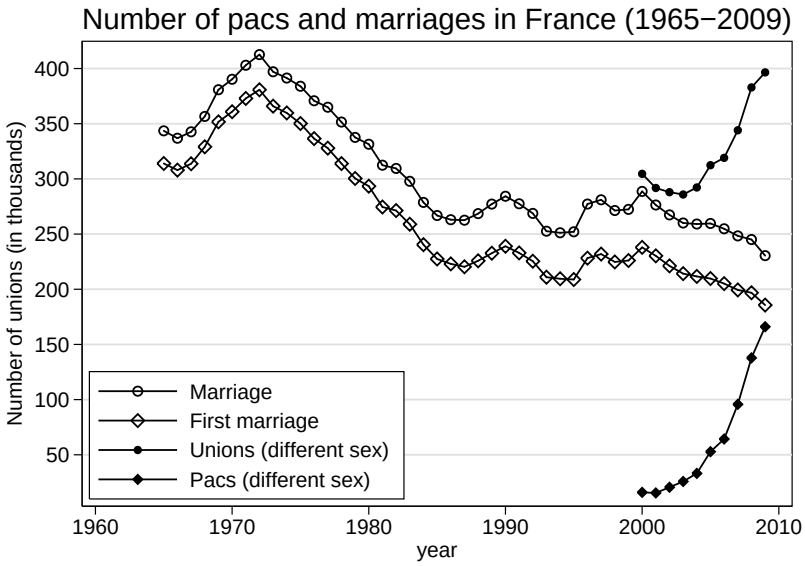


FIGURE 3.1: Number of marriage and pacs by 15-65 years old individuals (1965-2009)

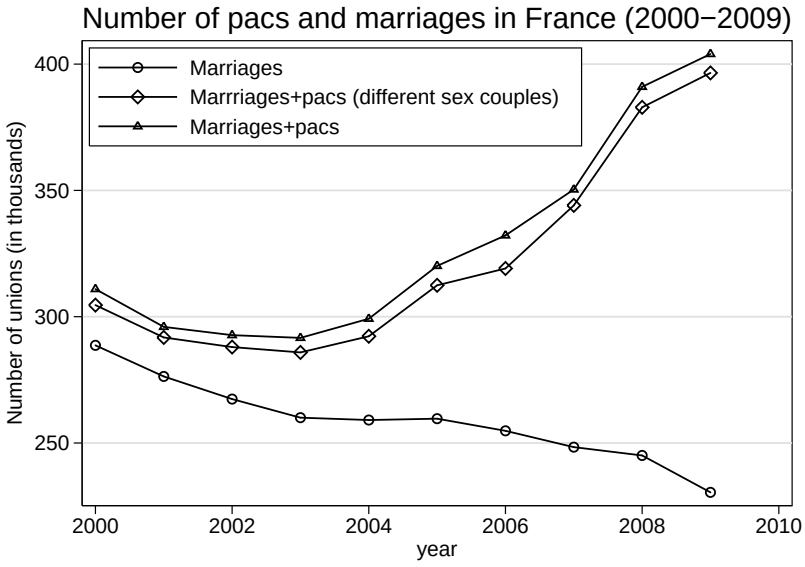


FIGURE 3.2: Number of marriage by 15-65 years old individuals (2000-2009)

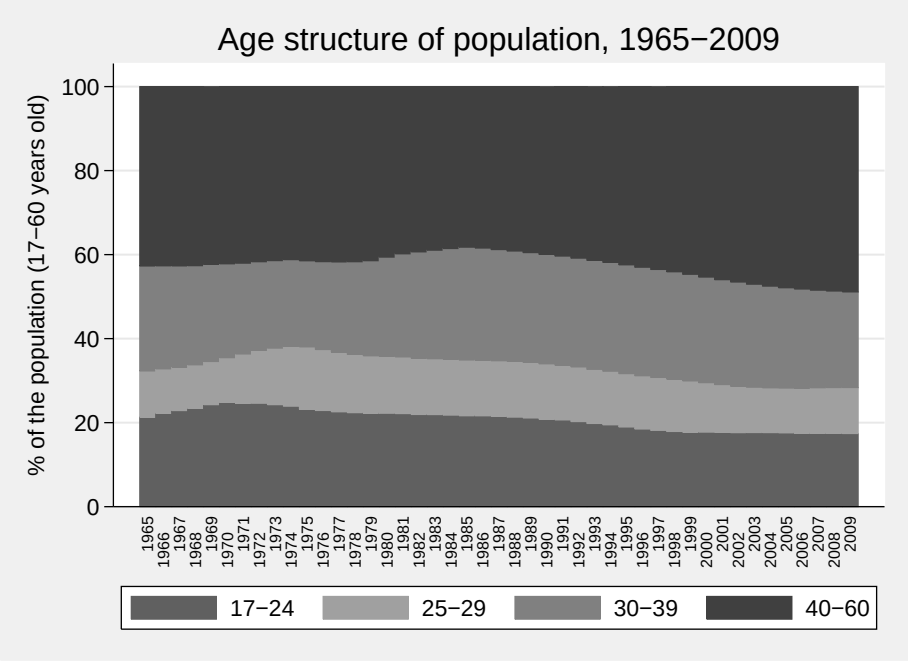


FIGURE 3.3: Age structure of population

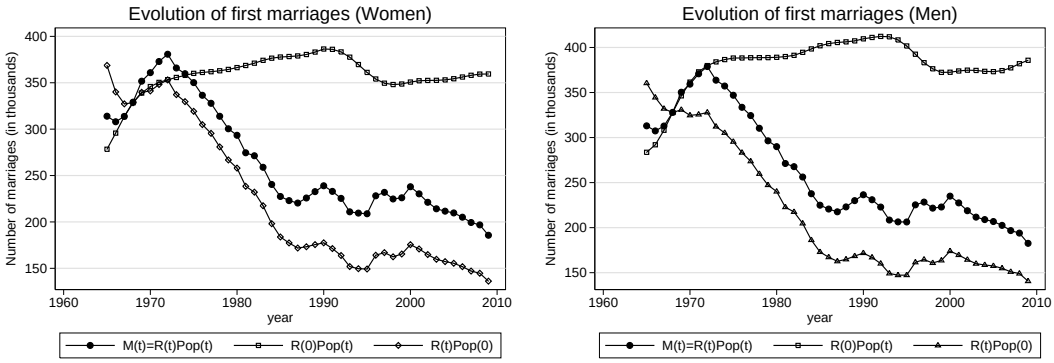


FIGURE 3.4: Evolution of marriages keeping rates or population constant

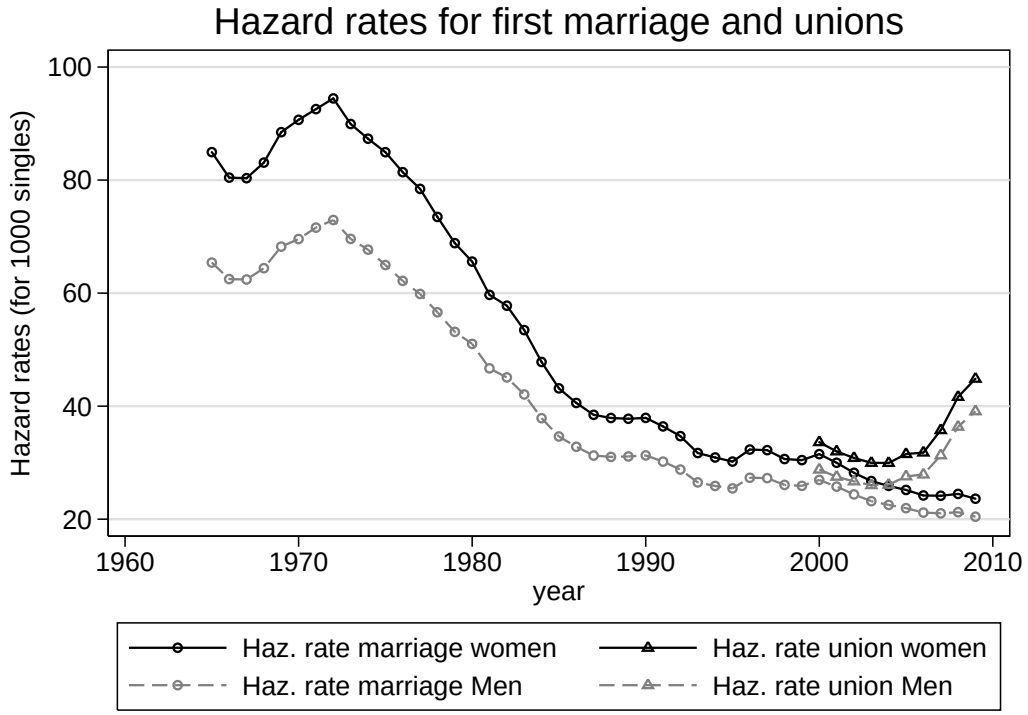


FIGURE 3.5: Hazard rates of marriage and union by 15-65 years old individuals (1965-2009)

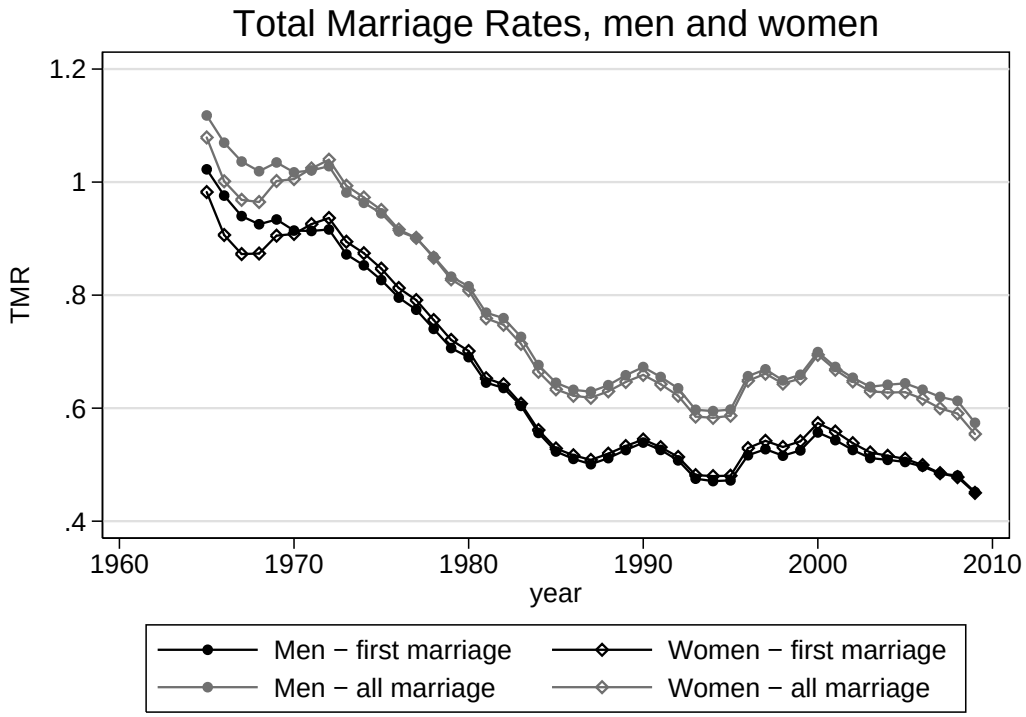


FIGURE 3.6: Total Marriage rate by 15-65 years old individuals (1965-2009)

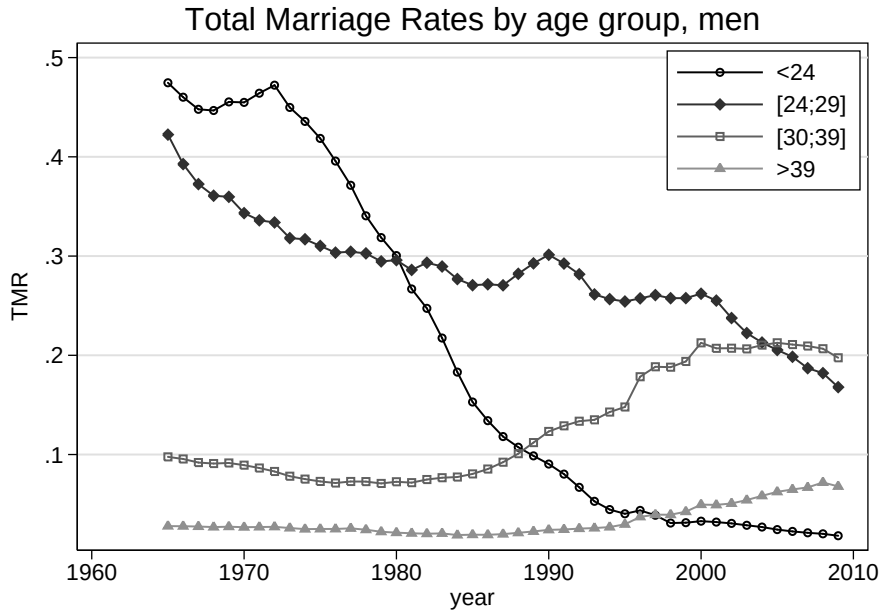


FIGURE 3.7: Total Marriage rate divided by age groups, by 15-65 years old individuals (1965-2009)

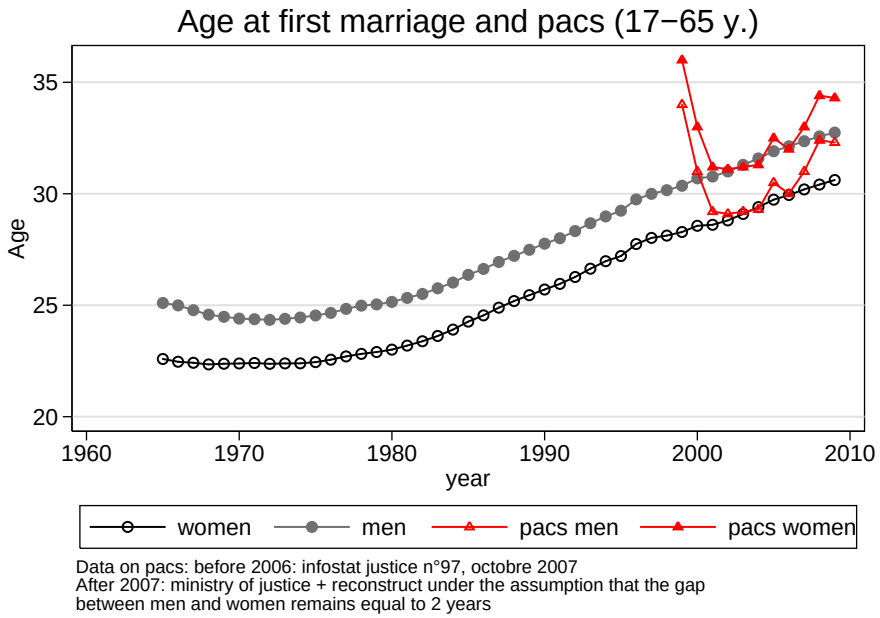


FIGURE 3.8: Mean age at first marriage

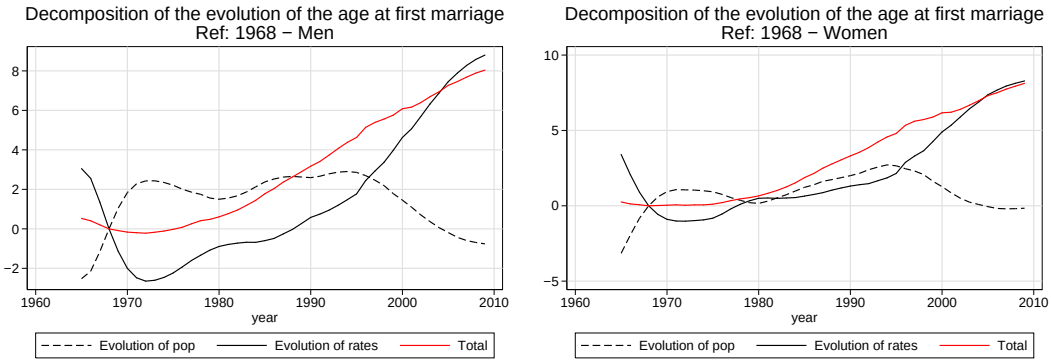


FIGURE 3.9: Decomposition of the age at first marriage

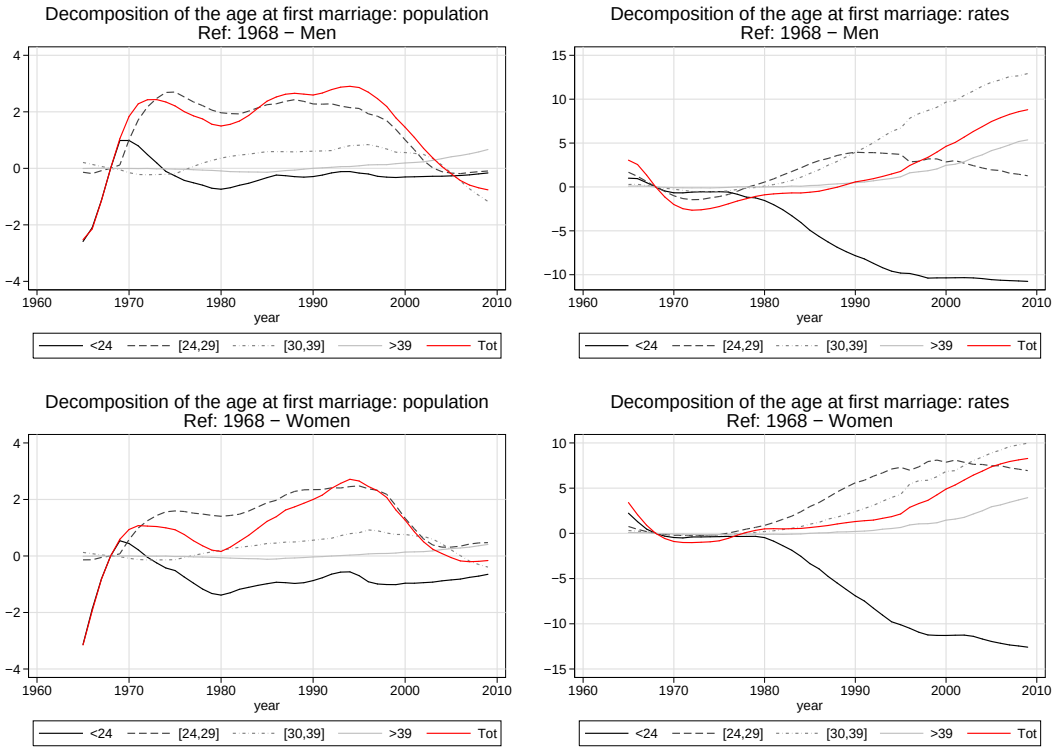


FIGURE 3.10: Decomposition of the age at first marriage , by age group

7.2 Cohort approach

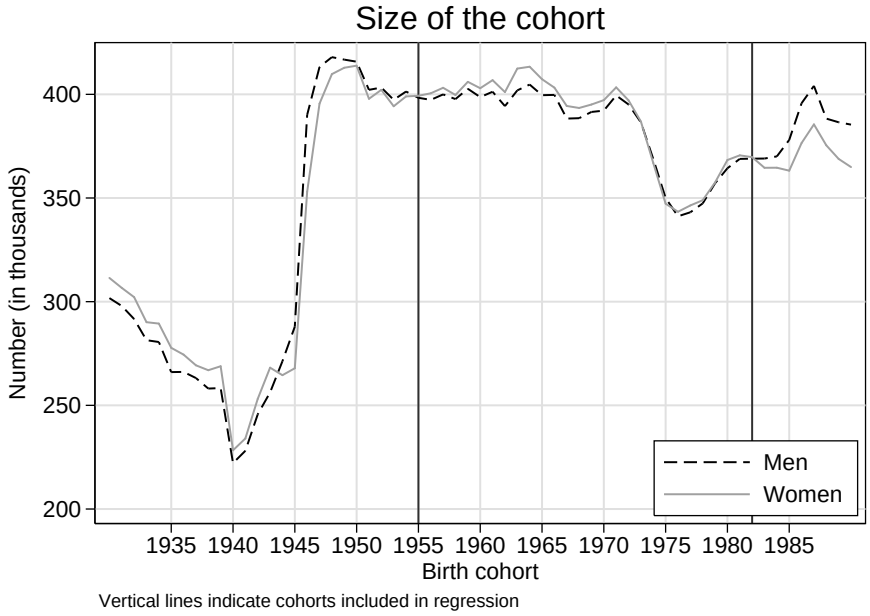


FIGURE 3.11: Size of the cohorts

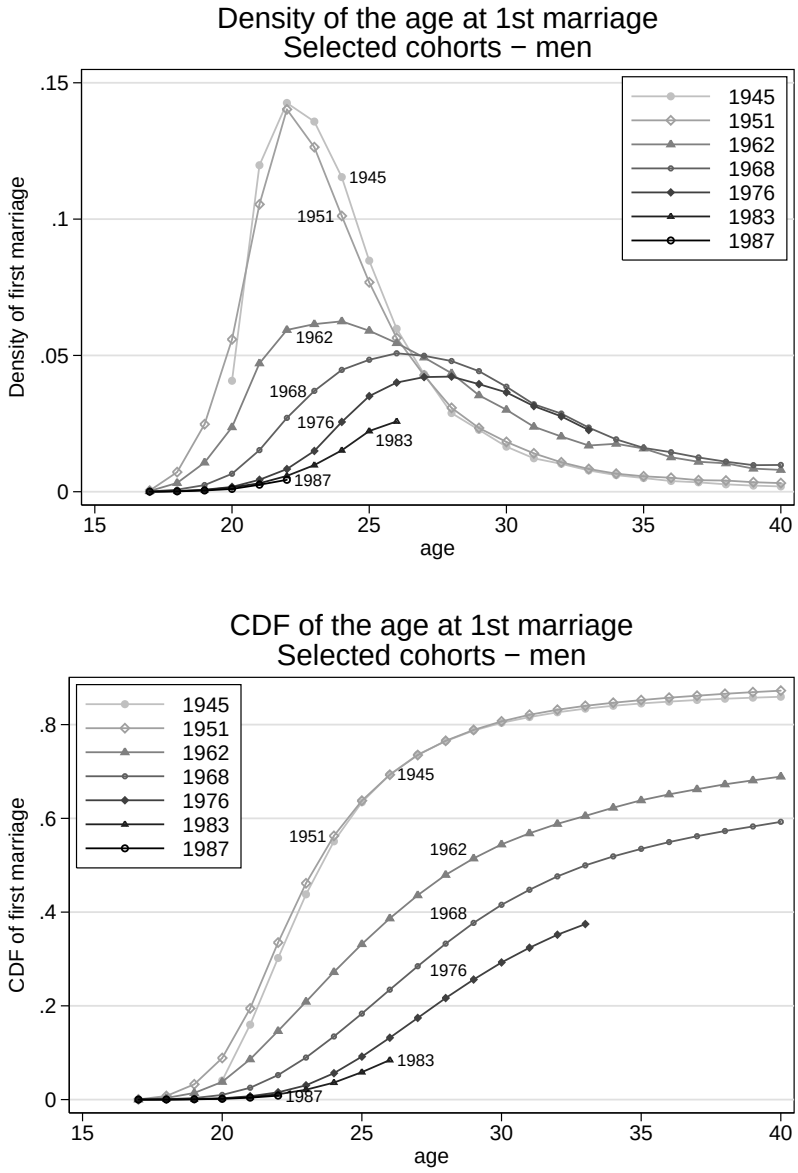


FIGURE 3.12: Distribution of age at first marriages for selected cohorts - Men

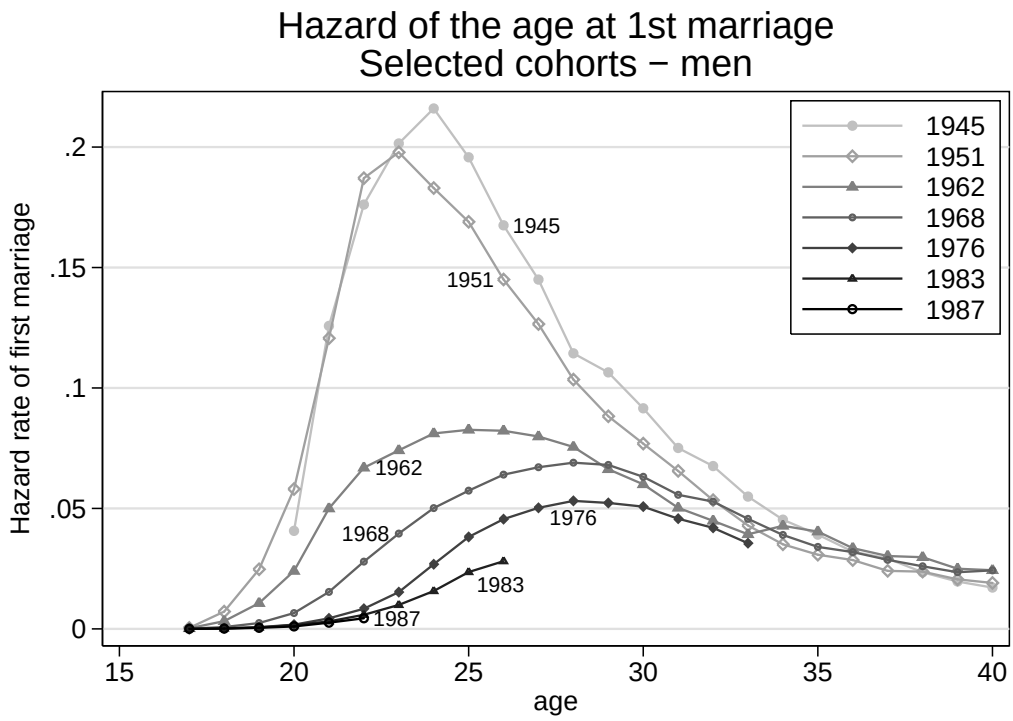


FIGURE 3.13: Hazard rate of age at first marriages for selected cohorts - Men

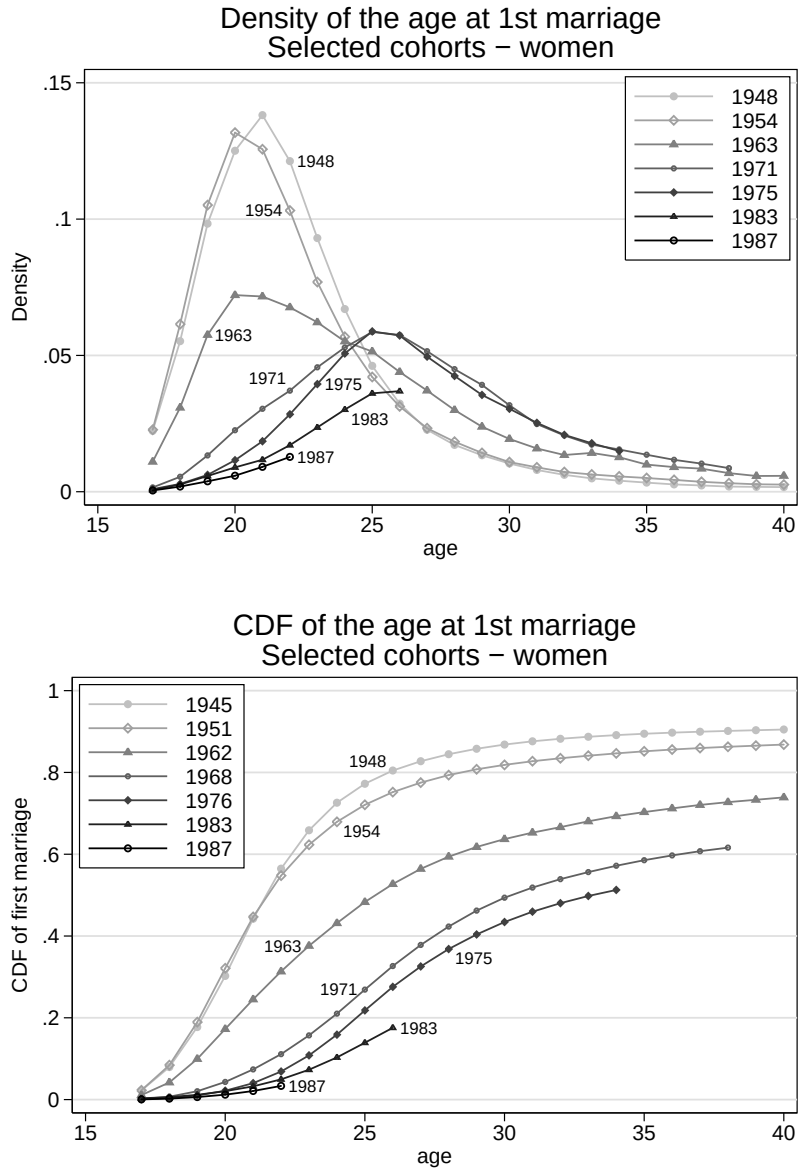


FIGURE 3.14: Distribution of age at first marriages for selected cohorts - Women

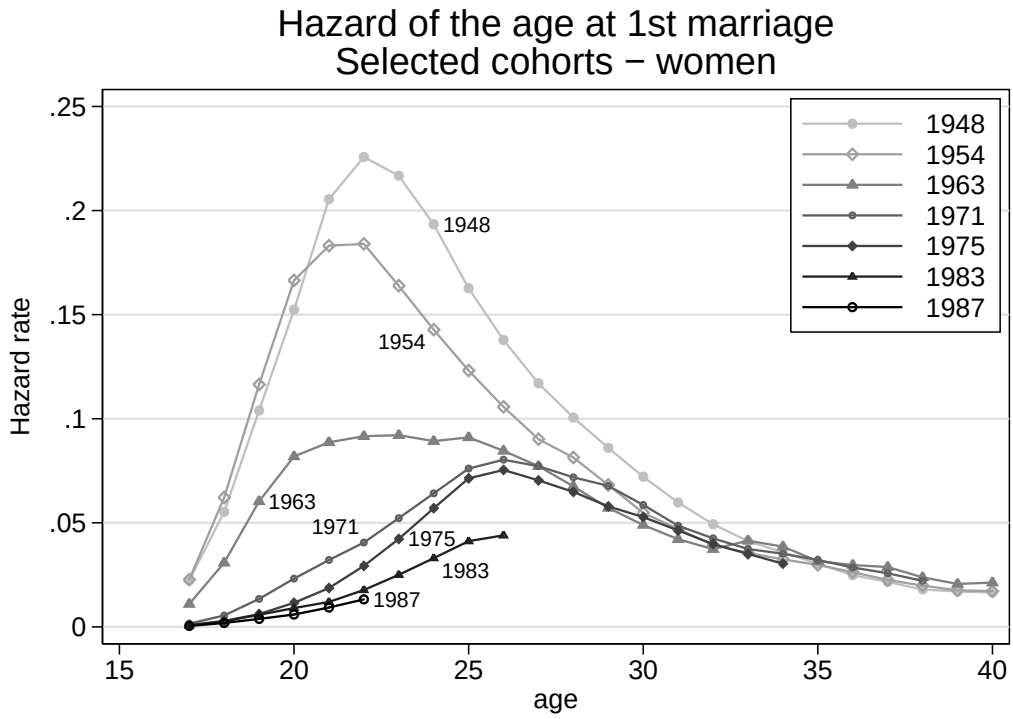


FIGURE 3.15: Hazard rate of age at first marriages for selected cohorts - Women

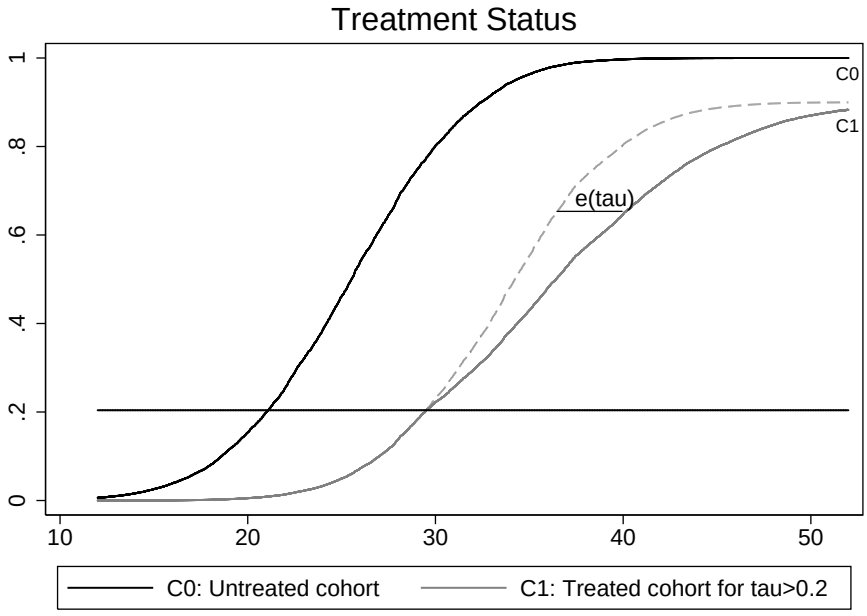


FIGURE 3.16: Definition of treatment status

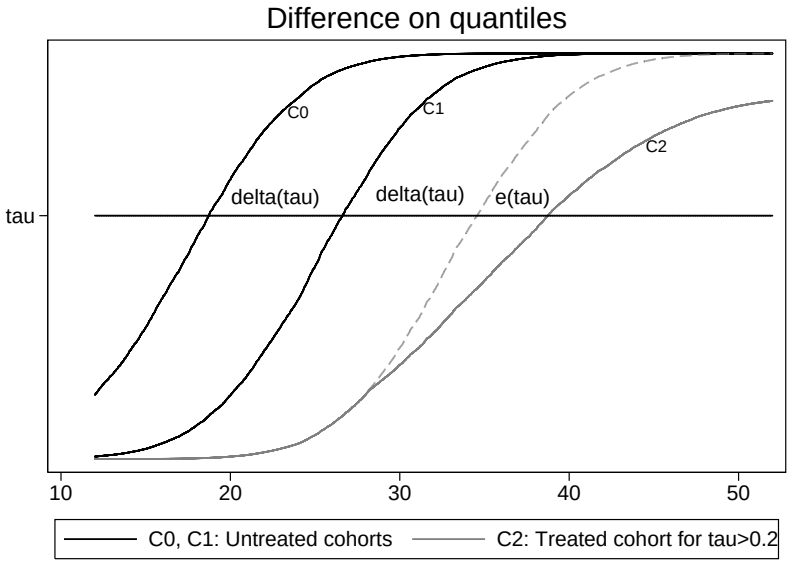


FIGURE 3.17: Illustration of the identification on quantiles

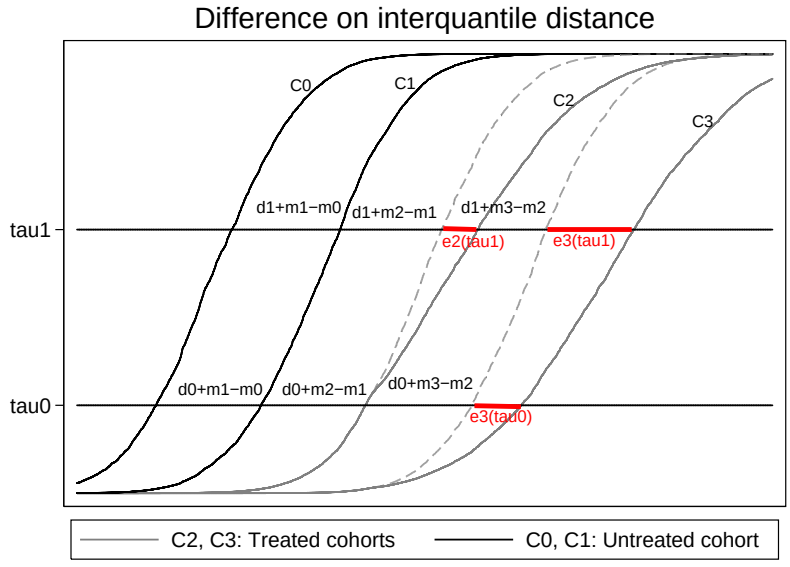


FIGURE 3.18: Illustration of the identification on interquantile distance

7.3 Quantiles

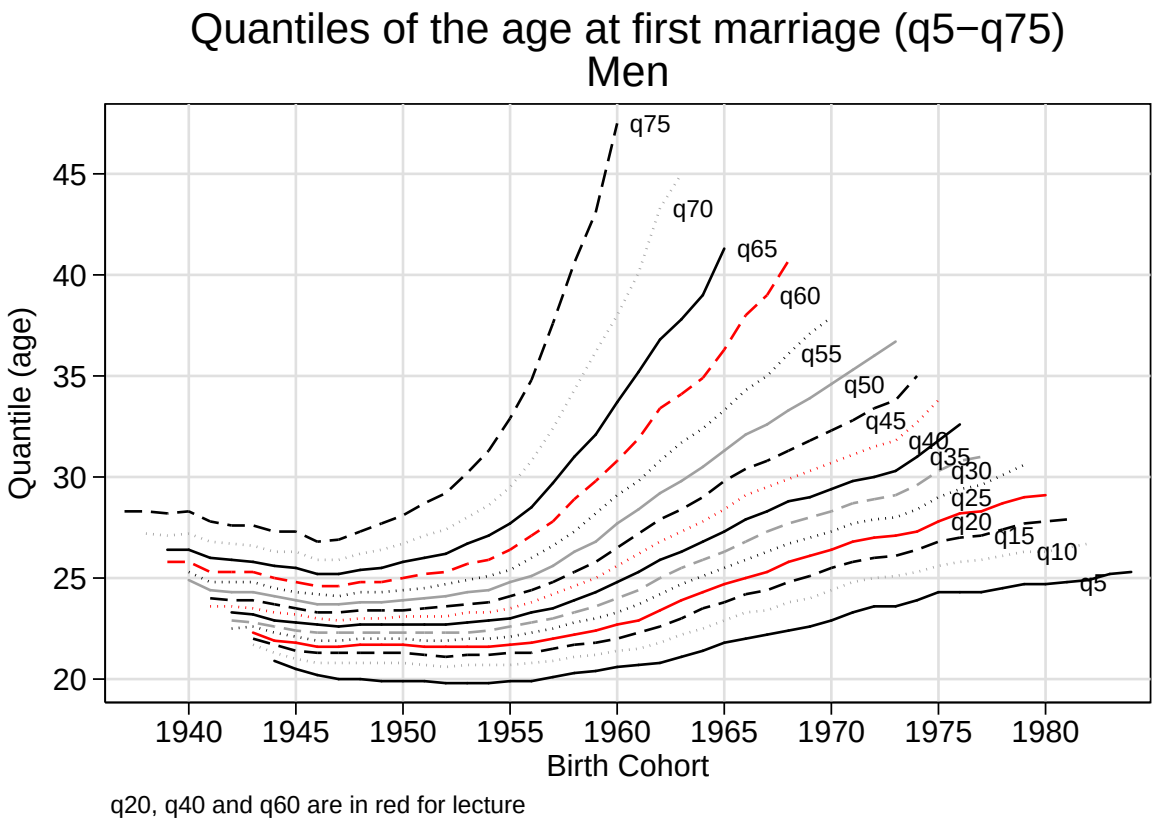


FIGURE 3.19: All quantiles (men)

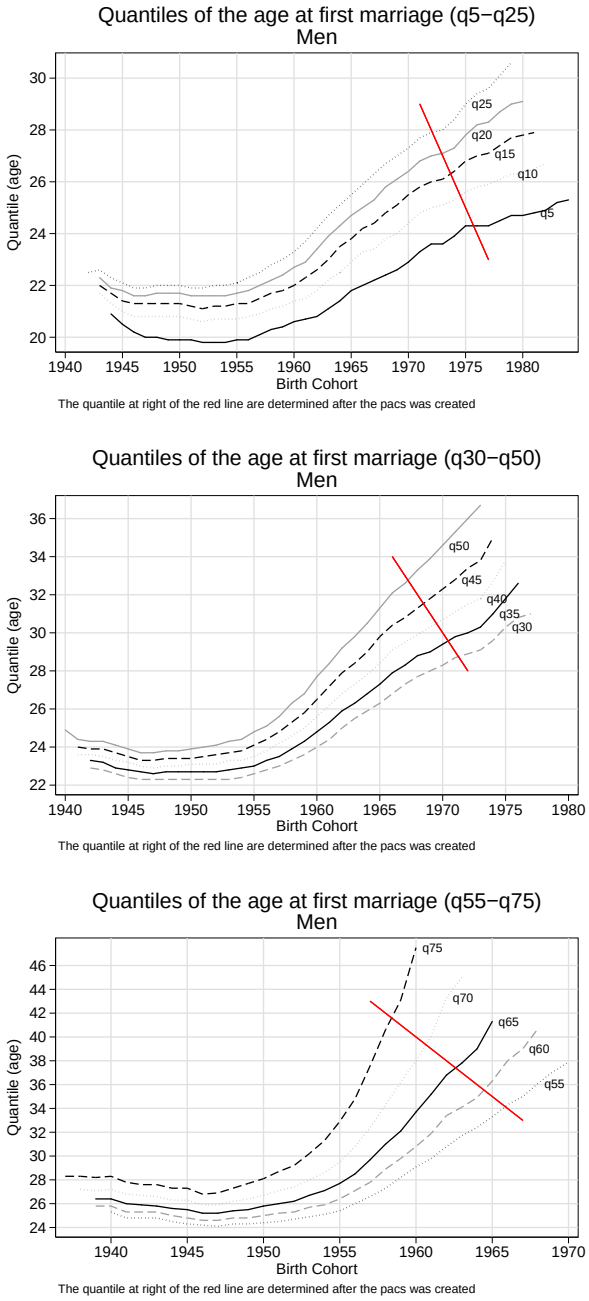


FIGURE 3.20: Quantiles (men)

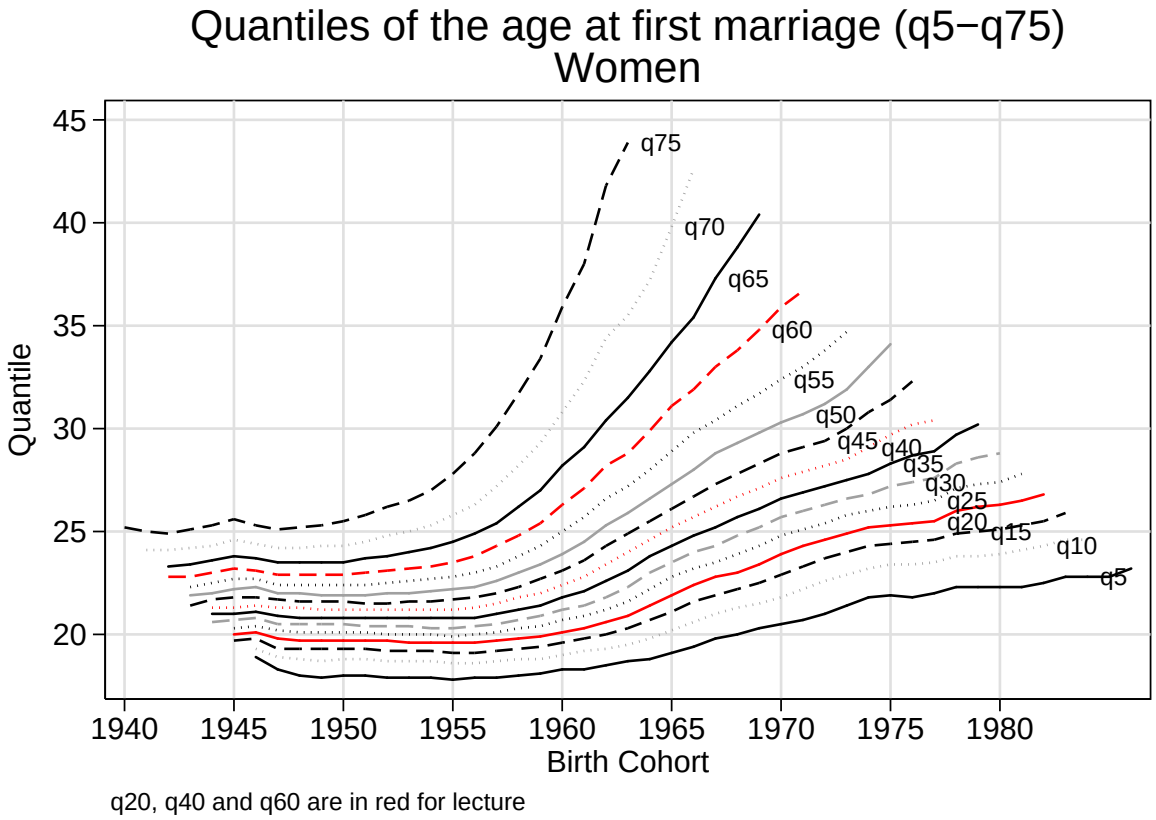


FIGURE 3.21: All quantiles (women)

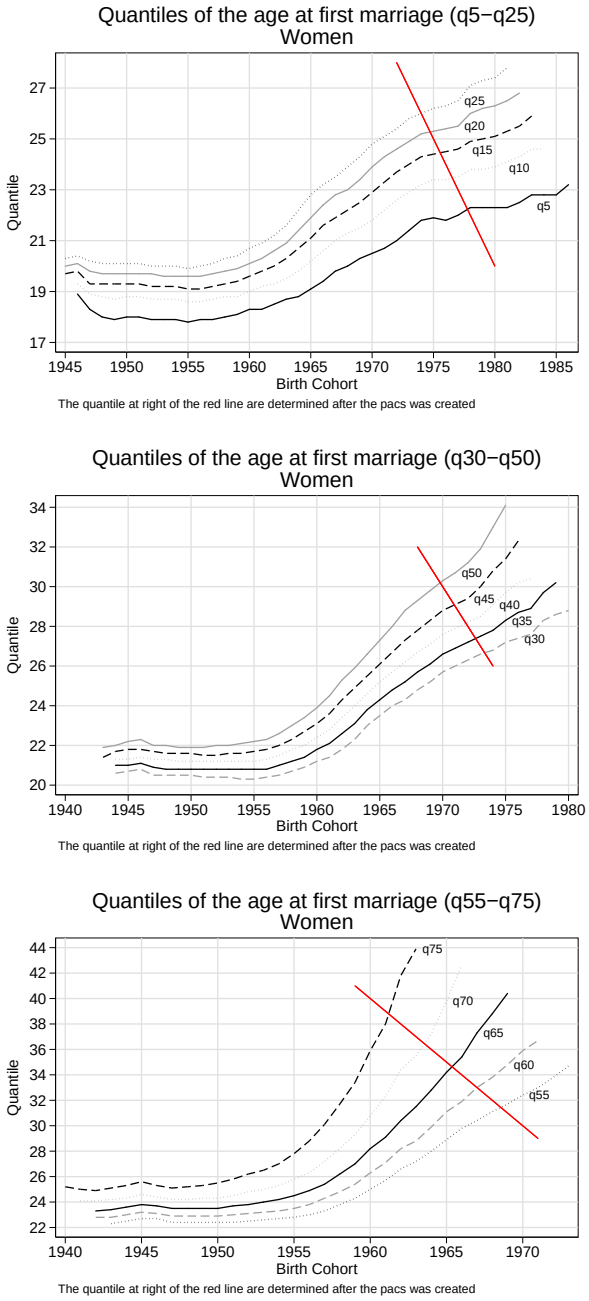


FIGURE 3.22: Quantiles (women)

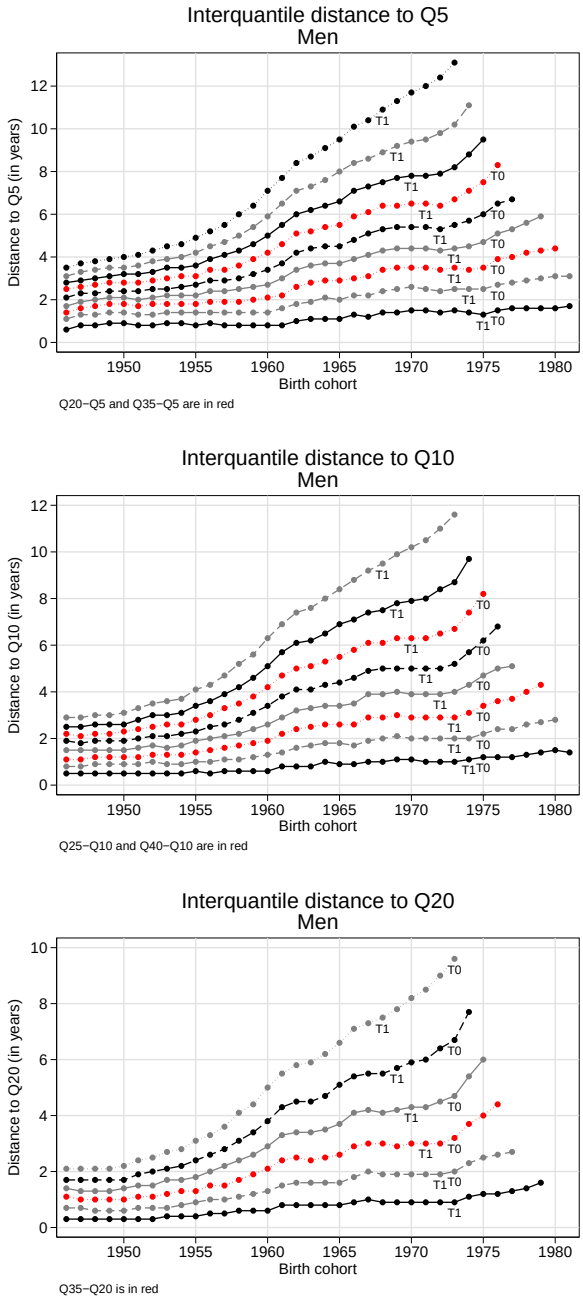


FIGURE 3.23: Interquantile distance (men)

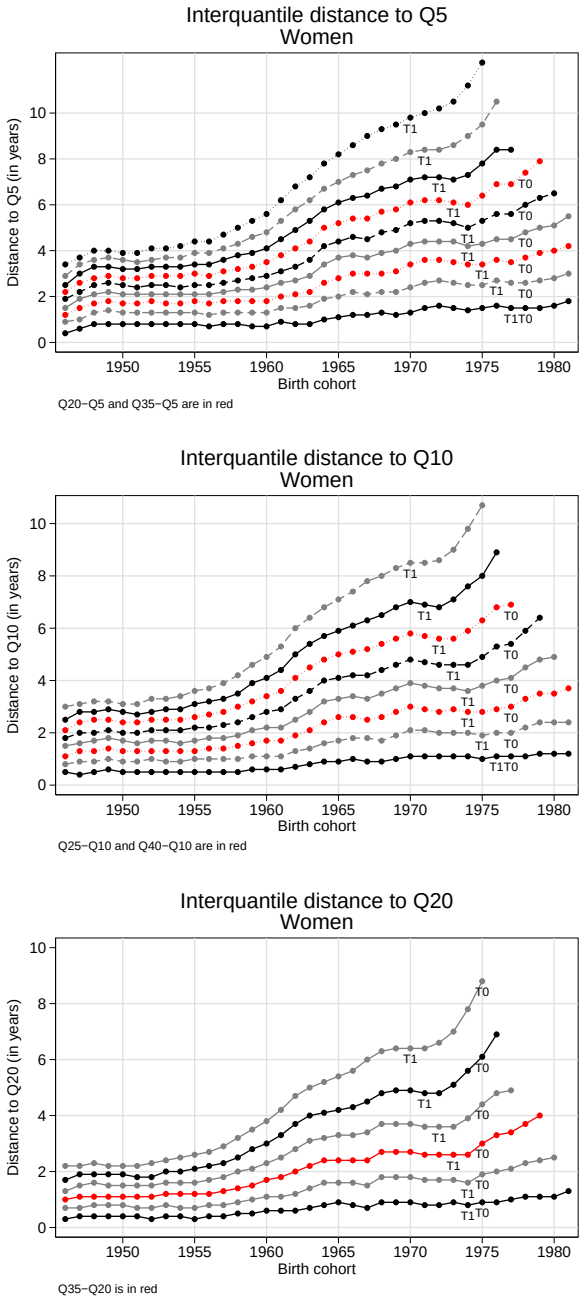


FIGURE 3.24: Interquantile distance (women)

7.4 Results

7.4.1 Coefficients

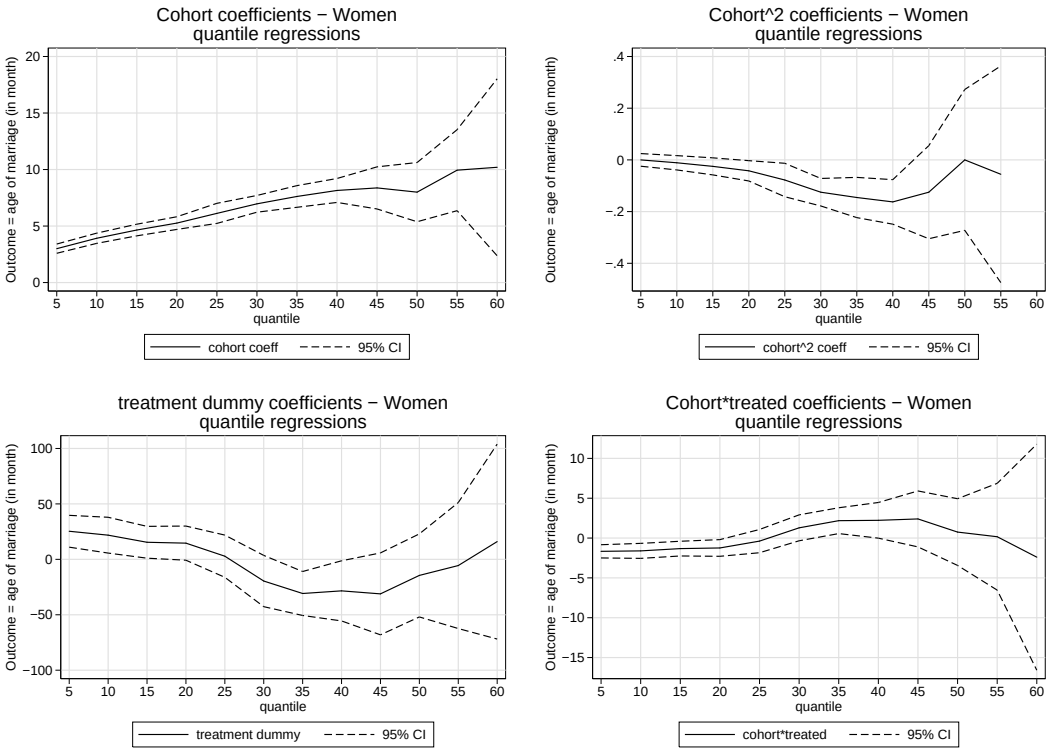


FIGURE 3.25: Coefficients of Quantile regressions (women)

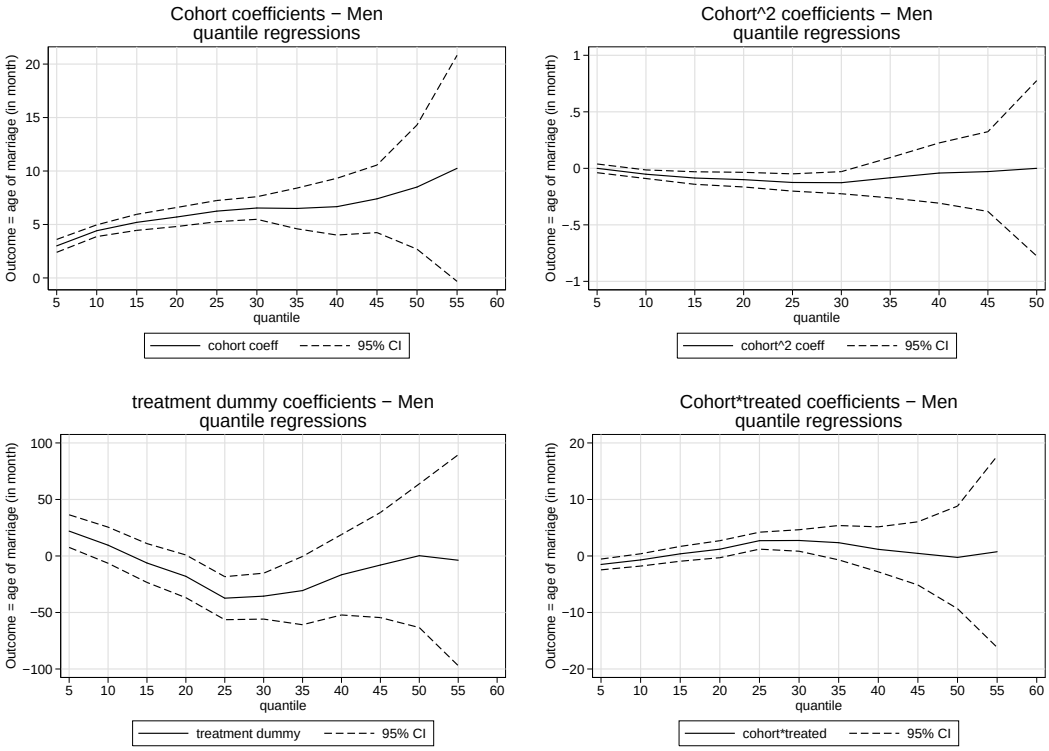


FIGURE 3.26: Coefficients of Quantile regressions (men)

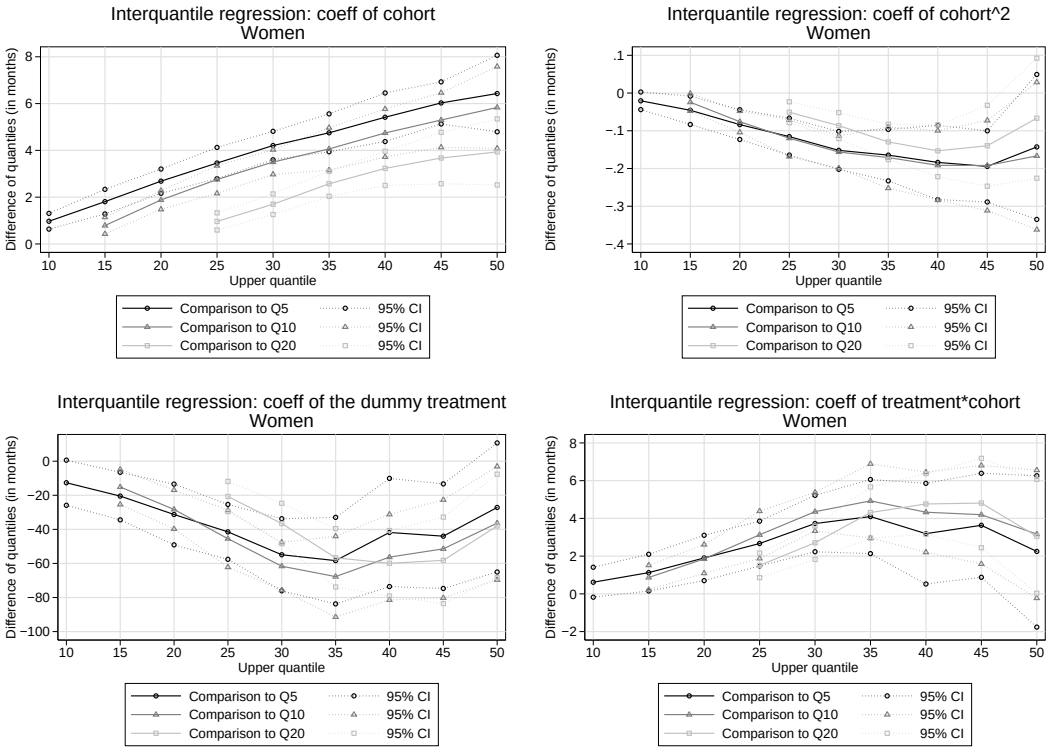


FIGURE 3.27: Coefficients of Interquantile regressions (women)

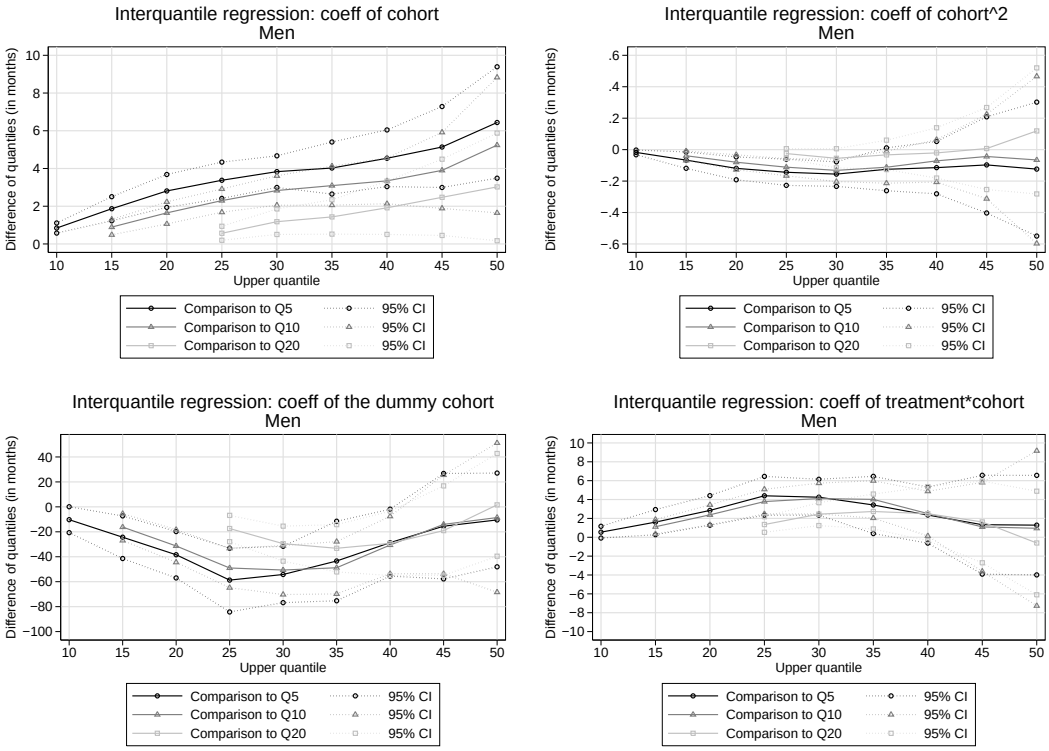


FIGURE 3.28: Coefficients of Interquantile regressions (men)

7.4.2 Cohorts

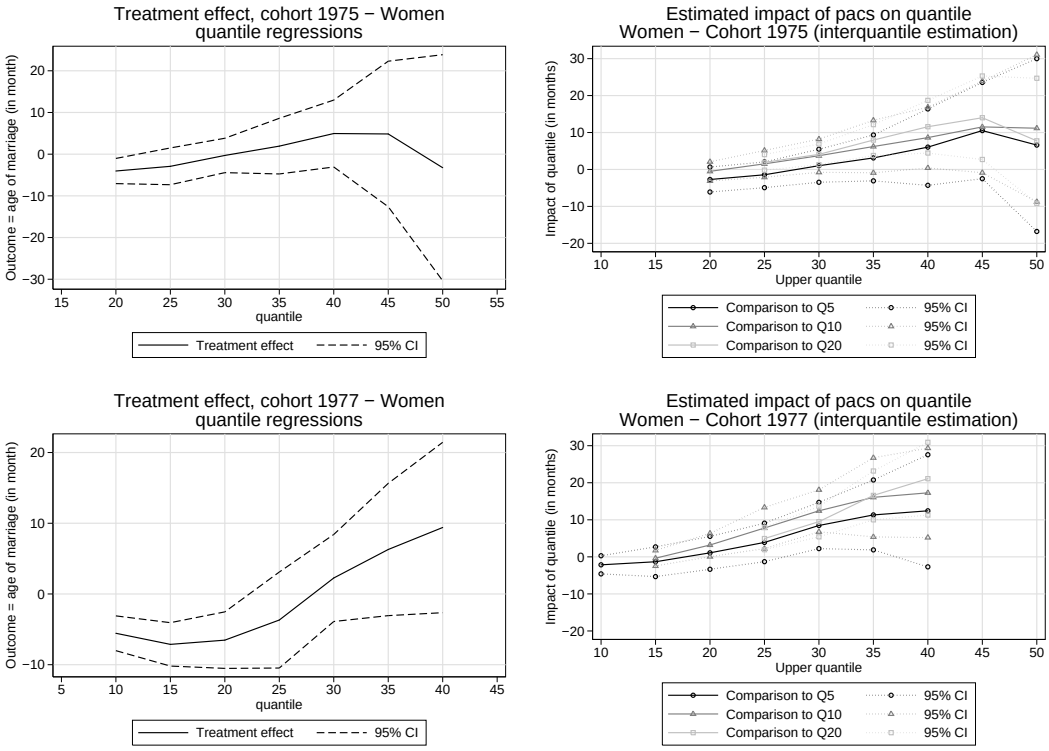


FIGURE 3.29: Quantile Treatment Effect (women)

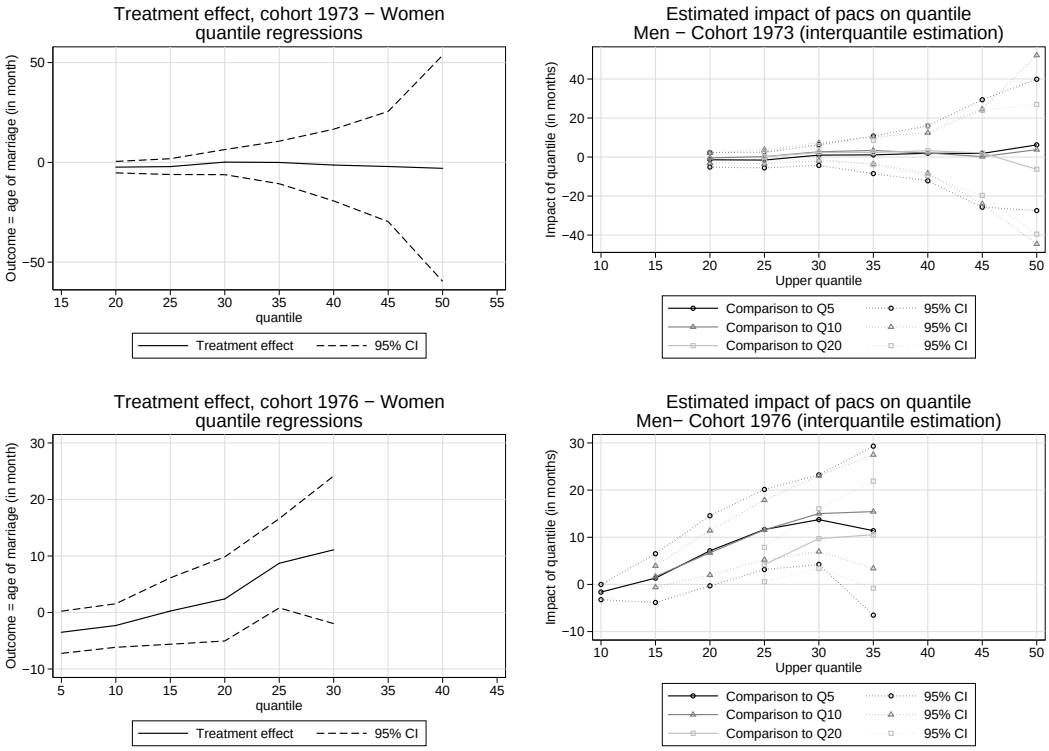


FIGURE 3.30: Quantile Treatment Effect (men)

7.5 Estimations

7.5.1 Treatment status

TABLE 3.2: Treatment status of cohorts depending on the quantile - Women

cohort	First	Last	in 2000	in 2005	q5	q10	q15	q20	q25	q30	q35	q40	q45	q50	q55	q60
1955	0	0.86	0.85	0.86	U	U	U	U	U	U	U	U	U	U	U	U
1956	0	0.85	0.84	0.85	U	U	U	U	U	U	U	U	U	U	U	U
1957	0	0.84	0.82	0.83	U	U	U	U	U	U	U	U	U	U	U	U
1958	0	0.83	0.81	0.82	U	U	U	U	U	U	U	U	U	U	U	U
1959	0	0.82	0.79	0.81	U	U	U	U	U	U	U	U	U	U	U	U
1960	0	0.80	0.77	0.79	U	U	U	U	U	U	U	U	U	U	U	U
1961	0	0.79	0.76	0.78	U	U	U	U	U	U	U	U	U	U	U	U
1962	0	0.77	0.73	0.75	U	U	U	U	U	U	U	U	U	U	U	U
1963	0	0.76	0.71	0.74	U	U	U	U	U	U	U	U	U	U	U	U
1964	0	0.74	0.69	0.72	U	U	U	U	U	U	U	U	U	U	U	U
1965	0	0.72	0.66	0.70	U	U	U	U	U	U	U	U	U	U	U	U
1966	0	0.70	0.63	0.68	U	U	U	U	U	U	U	U	U	U	U	U
1967	0	0.69	0.60	0.66	U	U	U	U	U	U	U	U	U	U	U	T
1968	0	0.67	0.57	0.63	U	U	U	U	U	U	U	U	U	U	U	T
1969	0	0.65	0.53	0.61	U	U	U	U	U	U	U	U	U	U	T	T
1970	0	0.63	0.49	0.59	U	U	U	U	U	U	U	U	U	T	T	T
1971	0	0.62	0.44	0.57	U	U	U	U	U	U	U	U	T	T	T	T
1972	0	0.60	0.39	0.54	U	U	U	U	U	U	U	T	T	T	T	
1973	0	0.57	0.32	0.50	U	U	U	U	U	U	T	T	T	T	T	
1974	0	0.54	0.25	0.46	U	U	U	U	T	T	T	T	T	T		
1975	0	0.51	0.18	0.41	U	U	U	T	T	T	T	T	T	T		
1976	0	0.47	0.12	0.36	U	U	T	T	T	T	T	T	T			
1977	0	0.45	0.08	0.31	U	T	T	T	T	T	T	T				
1978	0	0.40	0.04	0.24	T	T	T	T	T	T	T					
1979	0	0.36	0	0.19	T	T	T	T	T	T	T					
1980	0	0.33	0	0.14	T	T	T	T	T	T						
1981	0	0.28	0	0.10	T	T	T	T	T							
1982	0	0.23	0	0.06	T	T	T	T								
1983	0	0.17	0	0.04	T	T	T									
1984	0	0.13	0	0	T	T										
1985	0	0.09	0	0	T											
1986	0	0.06	0	0	T											
1987	0	0.03	0	0												

TABLE 3.3: Treatment status of cohorts depending on the quantile - Men

cohort	First	Last	in 2000	in 2005	q5	q10	q15	q20	q25	q30	q35	q40	q45	q50	q55	q60
1955	0	0.83	0.82	0.83	U	U	U	U	U	U	U	U	U	U	U	U
1956	0	0.82	0.80	0.81	U	U	U	U	U	U	U	U	U	U	U	U
1957	0	0.81	0.78	0.80	U	U	U	U	U	U	U	U	U	U	U	U
1958	0	0.79	0.76	0.78	U	U	U	U	U	U	U	U	U	U	U	U
1959	0	0.77	0.74	0.76	U	U	U	U	U	U	U	U	U	U	U	U
1960	0	0.76	0.72	0.74	U	U	U	U	U	U	U	U	U	U	U	U
1961	0	0.74	0.69	0.72	U	U	U	U	U	U	U	U	U	U	U	U
1962	0	0.72	0.66	0.70	U	U	U	U	U	U	U	U	U	U	U	U
1963	0	0.71	0.64	0.68	U	U	U	U	U	U	U	U	U	U	U	U
1964	0	0.69	0.62	0.67	U	U	U	U	U	U	U	U	U	U	U	U
1965	0	0.67	0.58	0.64	U	U	U	U	U	U	U	U	U	U	U	T
1966	0	0.64	0.54	0.61	U	U	U	U	U	U	U	U	U	U	T	T
1967	0	0.63	0.51	0.59	U	U	U	U	U	U	U	U	U	U	T	T
1968	0	0.61	0.47	0.56	U	U	U	U	U	U	U	U	U	T	T	T
1969	0	0.59	0.42	0.53	U	U	U	U	U	U	U	U	T	T	T	
1970	0	0.57	0.37	0.51	U	U	U	U	U	U	U	T	T	T	T	
1971	0	0.55	0.31	0.47	U	U	U	U	U	U	T	T	T	T		
1972	0	0.52	0.25	0.44	U	U	U	U	U	T	T	T	T	T		
1973	0	0.50	0.19	0.40	U	U	U	T	T	T	T	T	T	T		
1974	0	0.46	0.13	0.35	U	U	T	T	T	T	T	T	T			
1975	0	0.41	0.07	0.29	U	T	T	T	T	T	T	T				
1976	0	0.37	0.04	0.23	T	T	T	T	T	T	T					
1977	0	0.34	0.02	0.18	T	T	T	T	T	T						
1978	0	0.30	0.01	0.13	T	T	T	T	T							
1979	0	0.25	0	0.09	T	T	T	T	T							
1980	0	0.22	0	0.06	T	T	T	T								
1981	0	0.17	0	0.03	T	T	T									
1982	0	0.13	0	0.02	T	T										
1983	0	0.08	0	0.01	T											
1984	0	0.06	0	0	T											
1985	0	0.03	0	0												
1986	0	0.02	0	0												
1987	0	0.01	0	0												

7.5.2 Before-After estimation on quantiles

TABLE 3.4: Women - quantile Q5 - cohorts 1960-1986

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
cohort	2.455***	3.000***	2.667***	3.000***	3.912***	3.000***	3.914***	3.000***
	(0.047)	(0.075)	(0.041)	(0.063)	(0.129)	(0.246)	(0.167)	(0.206)
T2000		25.333***		38.333**		25.333**		38.333**
		(5.762)		(11.903)		(7.985)		(12.923)
cohort*T2000		-1.667***		-2.333***		-1.667***		-2.333***
		(0.274)		(0.607)		(0.464)		(0.674)
T2005			19.833	-16.833			-9.272	-16.833
			(24.735)	(28.187)			(25.844)	(28.252)
cohort*T2005			-1.167	0.833			0.372	0.833
			(1.004)	(1.223)			(1.063)	(1.237)
$cohort^2$					-0.058***	0.000	-0.058***	0.000
					(0.005)	(0.015)	(0.008)	(0.012)
Constant	219.091***	216.000***	217.667***	216.000***	213.407***	216.000***	213.405***	216.000***
	(0.513)	(0.560)	(0.417)	(0.560)	(0.609)	(0.758)	(0.668)	(0.797)
Observations	99010	99010	99010	99010	99010	99010	99010	99010

Standard errors in parentheses. Observations × 100.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Treated cohorts : 1978-1986

TABLE 3.5: Women - quantile Q20 - cohorts 1960-1982

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
cohort	3.867***	4.667***	4.214***	4.667***	5.992***	5.263***	6.188***	5.267***
	(0.052)	(0.071)	(0.065)	(0.072)	(0.175)	(0.330)	(0.233)	(0.342)
T2000		26.833***		26.833*		14.614		17.100
		(4.089)		(12.801)		(8.201)		(9.900)
cohort*T2000		-2.167***		-2.167**		-1.244*		-1.409*
		(0.248)		(0.776)		(0.576)		(0.652)
T2005			21.190	-3.167			-18.448	-10.082
			(17.798)	(24.114)			(16.266)	(19.888)
cohort*T2005			-1.548	0.167			0.964	0.548
			(0.888)	(1.274)			(0.823)	(1.049)
$cohort^2$					-0.099***	-0.042	-0.109***	-0.042
					(0.008)	(0.022)	(0.013)	(0.023)
Constant	243.267***	238.667***	241.143***	238.667***	235.917***	237.591***	235.062***	237.582***
	(0.543)	(0.548)	(0.616)	(0.637)	(0.783)	(0.991)	(0.703)	(0.996)
Observations	84319	84319	84319	84319	84319	84319	84319	84319

Standard errors in parentheses. Observations × 100.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Treated cohorts : 1975-1982

TABLE 3.6: Women - quantile Q50 - cohorts 1960-1975

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
cohort	7.500***	8.000***	7.333***	8.000***	7.889***	8.000***	9.475***	9.271***
	(0.199)	(0.304)	(0.199)	(0.349)	(0.734)	(1.334)	(0.830)	(1.492)
T2000		-14.500		10.000		-14.500		-3.400
		(14.484)		(20.998)		(21.135)		(25.896)
cohort*T2000		0.750		-1.500		0.750		0.057
		(1.268)		(1.864)		(2.343)		(2.659)
T2005			-75.667	-83.000			-104.825	-94.571
			(5048.984)	(4917.422)			(4641.830)	(4646.469)
cohort*T2005			5.667	6.500			8.237	7.400
			(360.614)	(351.160)			(331.597)	(331.868)
$cohort^2$					-0.028	-0.000	-0.162**	-0.129
					(0.052)	(0.143)	(0.062)	(0.148)
Constant	289.000***	287.000***	289.667***	287.000***	288.139***	287.000***	284.700***	284.971***
	(1.386)	(1.569)	(1.241)	(1.356)	(2.090)	(2.576)	(2.271)	(3.210)
Observations	59267	59267	59267	59267	59267	59267	59267	59267

Standard errors in parentheses. Observations $\times$ 100.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Treated cohorts : 1970-1975

TABLE 3.7: Men - quantile Q5 - cohorts 1960-1984

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
cohort	2.500***	3.000***	2.727***	3.000***	3.833***	3.000***	3.775***	3.000***
	(0.045)	(0.055)	(0.053)	(0.083)	(0.159)	(0.273)	(0.196)	(0.288)
T2000		22.000***		24.667*		22.000*		24.667*
		(4.964)		(10.322)		(9.095)		(11.213)
cohort*T2000		-1.500***		-1.667**		-1.500**		-1.667*
		(0.256)		(0.584)		(0.555)		(0.656)
T2005			16.454	-6.667			-6.491	-6.667
			(19.646)	(22.788)			(22.721)	(22.220)
cohort*T2005			-1.061	0.333			0.244	0.333
			(0.885)	(1.080)			(1.037)	(1.036)
$cohort^2$					-0.056***	0.000	-0.052***	0.000
					(0.007)	(0.018)	(0.010)	(0.018)
Constant	248.000***	245.000***	246.545***	245.000***	243.000***	245.000***	243.145***	245.000***
	(0.490)	(0.407)	(0.508)	(0.650)	(0.731)	(0.849)	(0.786)	(0.821)
Observations	90957	90957	90957	90957	90957	90957	90957	90957

Standard errors in parentheses. Observations $\times$ 100.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Treated cohorts : 1976-1984

TABLE 3.8: Men - quantile Q20 - cohorts 1960-1980

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
cohort	3.889***	4.429***	4.000***	4.429***	5.125***	5.700***	5.545***	5.583***
	(0.063)	(0.119)	(0.083)	(0.110)	(0.260)	(0.511)	(0.269)	(0.493)
T2000		4.952		-6.714		-18.000		-24.733
		(4.385)		(9.601)		(9.862)		(14.666)
cohort*T2000		-0.762**		0.071		1.200		1.667
		(0.290)		(0.704)		(0.824)		(1.093)
T2005			15.000	24.000			-14.818	9.700
			(16.852)	(22.234)			(18.496)	(21.372)
cohort*T2005			-1.000	-1.500			1.000	-0.675
			(0.928)	(1.281)			(1.046)	(1.253)
$cohort^2$					-0.062***	-0.100*	-0.091***	-0.092*
					(0.014)	(0.040)	(0.017)	(0.036)
Constant	275.444***	272.714***	275.000***	272.714***	271.188***	270.000***	270.273***	270.200***
	(0.657)	(0.818)	(0.786)	(0.796)	(0.985)	(1.196)	(0.895)	(1.300)
Observations	76182	76182	76182	76182	76182	76182	76182	76182

Standard errors in parentheses. Observations $\times$ 100.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Treated cohorts : 1973-1980

TABLE 3.9: Men - quantile Q50 - cohorts 1960-1973

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
cohort	8.222***	8.500***	8.250***	8.500***	8.655***	8.500**	9.300***	9.333***
	(0.382)	(0.511)	(0.410)	(0.504)	(1.419)	(3.112)	(1.479)	(2.567)
T2000		2.500		2.500		2.500		-3.250
		(21.220)		(35.508)		(31.287)		(33.030)
cohort*T2000		-0.500		-0.500		-0.500		0.250
		(2.297)		(4.058)		(4.381)		(4.348)
T2005			-3.750	-5.500			-15.800	-9.917
			(826.083)	(1467.304)			(1474.448)	(1021.137)
cohort*T2005			0.250	0.500			1.600	0.917
			(75.087)	(133.291)			(133.874)	(92.831)
$cohort^2$					-0.036	0.000	-0.100	-0.083
					(0.118)	(0.395)	(0.156)	(0.344)
Constant	333.333***	332.500***	333.250***	332.500***	332.382***	332.500***	331.000***	330.750***
	(2.159)	(1.755)	(2.055)	(2.083)	(3.371)	(4.787)	(3.167)	(4.090)
Observations	51452	51452	51452	51452	51452	51452	51452	51452

Standard errors in parentheses. Observations $\times$ 100.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Treated cohorts : 1968-1973

7.5.3 DiD estimation on interquantile distances

TABLE 3.10: Women - interquantile Q5-Q10 - cohorts 1960-1984

	(1)	(2)	(3)	(4)	(5)	(6)
cohort	0.476***	0.598***	0.598***	0.700***	0.844***	0.844***
	(0.037)	(0.053)	(0.059)	(0.129)	(0.131)	(0.123)
T2000(q10)		-5.161			-10.287*	
		(4.128)			(4.434)	
cohort*T2000(q10)		0.152	-0.226**		0.541*	-0.179*
		(0.235)	(0.084)		(0.254)	(0.082)
T2000(q5)			0.839			-4.803
			(5.958)			(5.488)
cohort*T2000(q5)			0.044			0.418
			(0.327)			(0.319)
$cohort^2$				-0.012	-0.018**	-0.018**
				(0.007)	(0.007)	(0.007)
Constant	11.119***	10.411***	10.411***	10.500***	10.005***	10.005***
	(0.353)	(0.427)	(0.528)	(0.491)	(0.475)	(0.480)
Observations	87528	87528	87528	87528	87528	87528

Standard errors in parentheses. Observations × 100.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Treated cohorts for q5 : 1978-1984 ; for q10 : 1977-1984

TABLE 3.11: Women - interquantile Q5-Q20 - cohorts 1960-1982

	(1)	(2)	(3)	(4)	(5)	(6)
cohort	1.253***	1.600***	1.600***	2.083***	2.683***	2.699***
	(0.051)	(0.067)	(0.073)	(0.145)	(0.256)	(0.281)
T2000(q20)		-5.900	2.600		-31.267***	-15.972
		(5.130)	(16.571)		(7.838)	(19.852)
cohort*T2000(q20)		-0.100	-0.600		1.903**	0.951
		(0.290)	(1.041)		(0.588)	(1.291)
T2000(q5)			-14.333			-28.494
			(16.927)			(22.543)
cohort*T2000(q5)			0.833			1.629
			(1.004)			(1.368)
$cohort^2$				-0.042***	-0.084***	-0.085***
				(0.007)	(0.022)	(0.021)
Constant	25.000***	23.400***	23.400***	22.458***	21.296***	21.281***
	(0.509)	(0.493)	(0.560)	(0.583)	(0.602)	(0.740)
Observations	88349	88349	88349	88349	88349	88349

Standard errors in parentheses. Observations × 100.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Treated cohorts for q5 : 1978-1982 ; for q20 : 1975-1982

TABLE 3.12: Women - interquantile Q5-Q50 - cohorts 1960-1975

	(1)	(2)	(4)	(5)
cohort	4.571***	5.250***	5.837***	6.429***
	(0.161)	(0.285)	(0.518)	(0.904)
T2000(q50)		-6.167		-27.143
		(11.553)		(15.919)
cohort*T2000(q50)		-0.167		2.250
		(1.000)		(1.724)
cohort^2			-0.096*	-0.143
			(0.037)	(0.105)
Constant	72.429***	70.000***	70.000***	68.714***
	(0.994)	(1.188)	(1.127)	(1.411)
Observations	63297	63297	63297	63297

Standard errors in parentheses. Observations $\times$ 100.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Treated cohorts for q5 : none ; for q50 : 1970-1975

TABLE 3.13: Women - interquantile Q10-Q20 - cohorts 1960-1982

	(1)	(2)	(3)	(4)	(5)	(6)
cohort	0.689***	0.850***	0.850***	1.076***	1.880***	1.820***
	(0.037)	(0.061)	(0.063)	(0.130)	(0.224)	(0.248)
T2000(q20)		-7.471	-6.400		-28.313***	-21.924
		(4.221)	(26.163)		(5.603)	(30.894)
cohort*T2000(q20)		0.221	0.150		1.854***	1.422
		(0.233)	(1.688)		(0.394)	(2.009)
T2000(q10)			2.083			-8.264
			(28.045)			(32.651)
cohort*T2000(q10)			-0.083			0.514
			(1.772)			(2.079)
cohort^2				-0.019**	-0.076***	-0.072***
				(0.006)	(0.016)	(0.018)
Constant	15.400***	14.400***	14.400***	14.000***	12.396***	12.567***
	(0.381)	(0.377)	(0.373)	(0.496)	(0.585)	(0.630)
Observations	88349	88349	88349	88349	88349	88349

Standard errors in parentheses. Observations $\times$ 100.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Treated cohorts for q10 : 1977-1982 ; for q20 : 1975-1982

TABLE 3.14: Women - interquantile Q10-Q50 - cohorts 1960-1975

	(1)	(2)	(4)	(5)
cohort	3.844***	4.500***	4.773***	5.833***
	(0.153)	(0.252)	(0.490)	(0.738)
T2000(q50)		-10.500		-36.333*
		(10.186)		(18.357)
cohort*T2000(q50)		0.250		3.167
		(0.875)		(1.899)
cohort^2			-0.072	-0.167
			(0.041)	(0.091)
Constant	63.338***	61.000***	61.905***	60.000***
	(1.001)	(1.117)	(1.158)	(1.239)
Observations	63297	63297	63297	63297

Standard errors in parentheses. Observations $\times$ 100.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Treated cohorts for q10 : none ; for q50 : 1970-1975

TABLE 3.15: Women - interquantile Q20-Q50 - cohorts 1960-1975

	(1)	(2)	(3)	(4)	(5)	(6)
cohort	3.071***	3.375***	3.375***	2.988***	3.933***	4.433***
	(0.170)	(0.241)	(0.219)	(0.521)	(0.759)	(0.640)
T2000(q50)		-27.625*	-14.792		-38.000*	-33.183
		(12.693)	(12.743)		(16.337)	(16.964)
cohort*T2000(q50)		1.875	0.708		3.050	2.817
		(1.100)	(1.128)		(1.695)	(1.691)
T2000(q20)			0.728			0.766
			(18.461)			(24.473)
$cohort^2$				0.001	-0.067	-0.129
				(0.042)	(0.086)	(0.072)
Constant	48.429***	47.625***	47.625***	49.000***	47.000***	47.000***
	(0.973)	(1.146)	(1.036)	(1.248)	(1.346)	(1.278)
Observations	63297	63297	63297	63297	63297	63297

Standard errors in parentheses. Observations $\times$ 100.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Treated cohorts for q20 : 1975 ; for q50 : 1970-1975

TABLE 3.16: Men - interquantile Q5-Q10 - cohorts 1960-1982

	(1)	(2)	(3)	(4)	(5)	(6)
cohort	0.476***	0.598***	0.598***	0.700***	0.844***	0.844***
	(0.037)	(0.053)	(0.059)	(0.129)	(0.131)	(0.123)
T2000(q10)		-5.161			-10.287*	
		(4.128)			(4.434)	
cohort*T2000(q10)		0.152	-0.226**		0.541*	-0.179*
		(0.235)	(0.084)		(0.254)	(0.082)
T2000(q5)			0.839			-4.803
			(5.958)			(5.488)
cohort*T2000(q5)			0.044			0.418
			(0.327)			(0.319)
$cohort^2$				-0.012	-0.018**	-0.018**
				(0.007)	(0.007)	(0.007)
Constant	11.119***	10.411***	10.411***	10.500***	10.005***	10.005***
	(0.353)	(0.427)	(0.528)	(0.491)	(0.475)	(0.480)
Observations	87528	87528	87528	87528	87528	87528

Standard errors in parentheses. Observations × 100.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Treated cohorts for q5 : 1976-1982 ; for q10 : 1975-1982

TABLE 3.17: Men - interquantile Q5-Q20 - cohorts 1960-1980

	(1)	(2)	(3)	(4)	(5)	(6)
cohort	1.195***	1.455***	1.455***	1.524***	2.810***	2.876***
	(0.063)	(0.115)	(0.093)	(0.193)	(0.354)	(0.387)
T2000(q20)		-11.479**	14.455		-38.393***	-9.321
		(3.927)	(16.785)		(7.836)	(20.046)
cohort*T2000(q20)		0.412	-1.455		2.845***	0.807
		(0.264)	(1.232)		(0.625)	(1.471)
T2000(q5)			-28.000			-42.348
			(19.881)			(22.222)
cohort*T2000(q5)			2.000			2.900
			(1.353)			(1.531)
$cohort^2$				-0.018	-0.119***	-0.129***
				(0.010)	(0.029)	(0.032)
Constant	28.467***	27.545***	27.545***	27.312***	25.000***	25.000***
	(0.634)	(0.687)	(0.642)	(0.754)	(0.851)	(0.847)
Observations	80149	80149	80149	80149	80149	80149

Standard errors in parentheses. Observations × 100.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Treated cohorts for q5 : 1976-1980 ; for q20 : 1973-1980

TABLE 3.18: Men - interquantile Q5-Q50 - cohorts 1960-1973

	(1)	(2)	(4)	(5)
cohort	5.273***	5.500***	5.992***	6.438***
	(0.310)	(0.434)	(0.799)	(1.891)
T2000(q50)		0.250		-10.486
		(15.902)		(29.832)
cohort*T2000(q50)		-0.250		1.286
		(1.663)		(4.015)
cohort^2			-0.062	-0.124
			(0.074)	(0.283)
Constant	88.000***	87.500***	86.333***	86.000***
	(1.447)	(1.757)	(1.758)	(2.311)
Observations	55426	55426	55426	55426

Standard errors in parentheses. Observations $\times$ 100.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Treated cohorts for q5 : none ; for q50 : 1968-1973

TABLE 3.19: Men - interquantile Q10-Q20 - cohorts 1960-1980

	(1)	(2)	(3)	(4)	(5)	(6)
cohort	0.706***	0.727***	0.727***	0.666***	1.647***	1.732***
	(0.042)	(0.070)	(0.080)	(0.170)	(0.250)	(0.238)
T2000(q20)		-12.806**	6.727		-31.353***	-7.446
		(4.666)	(25.193)		(6.822)	(23.752)
cohort*T2000(q20)		0.739*	-0.727		2.379***	0.606
		(0.293)	(1.860)		(0.537)	(1.783)
T2000(q10)			-15.000			-24.846
			(25.537)			(22.891)
cohort*T2000(q10)			1.200			1.866
			(1.876)			(1.718)
$cohort^2$				0.002	-0.080***	-0.087***
				(0.009)	(0.021)	(0.019)
Constant	17.444***	17.273***	17.273***	17.321***	15.766***	15.688***
	(0.402)	(0.411)	(0.494)	(0.699)	(0.606)	(0.702)
Observations	80149	80149	80149	80149	80149	80149

Standard errors in parentheses. Observations $\times$ 100.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Treated cohorts for q10 : 1975-1980 ; for q20 : 1973-1980

TABLE 3.20: Men - interquantile Q10-Q50 - cohorts 1960-1973

	(1)	(2)	(4)	(5)
cohort	4.648***	4.700***	4.738***	5.238**
	(0.300)	(0.396)	(0.882)	(1.594)
T2000(q50)		-1.550		-8.577
		(19.464)		(22.650)
cohort*T2000(q50)		0.050		0.952
		(2.062)		(2.953)
$cohort^2$			-0.013	-0.065
			(0.086)	(0.210)
Constant	77.250***	77.300***	77.238***	76.542***
	(1.438)	(1.424)	(1.802)	(2.357)
Observations	55426	55426	55426	55426

Standard errors in parentheses. Observations $\times$ 100.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Treated cohorts for q10 : none ; for q50 : 1968-1973

TABLE 3.21: Men - interquantile Q20-Q50 - cohorts 1960-1973

	(1)	(2)	(3)	(4)	(5)	(6)
cohort	3.973***	3.750***	3.750***	3.086**	3.024*	3.405*
	(0.265)	(0.368)	(0.448)	(1.059)	(1.202)	(1.505)
T2000(q50)		-12.000	-5.750		1.607	0.429
		(18.430)	(13.902)		(22.811)	(24.348)
cohort*T2000(q50)		1.250	0.583		-0.607	-0.321
		(1.859)	(1.541)		(2.919)	(3.300)
T2000(q20)			0.359			0.341
			(29.609)			(29.729)
$cohort^2$				0.067	0.119	0.060
				(0.098)	(0.179)	(0.227)
Constant	59.900***	60.750***	60.750***	61.333***	61.000***	61.000***
	(1.219)	(1.380)	(1.655)	(1.967)	(1.559)	(1.788)
Observations	55426	55426	55426	55426	55426	55426

Standard errors in parentheses. Observations $\times$ 100.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Treated cohorts for q20 : 1973 ; for q50 : 1968-1973

CHAPITRE 4

Do bankers prefer married couples ?
Marital status and credit constraints in France

1 Introduction

Encouraging access to property has been at the heart of political debates in France for the last decades. There are two main reasons keeping households away from ownership : households may not be willing to be owner or households may not be able to become owner. Political measures target the latter, providing state-supported loans (such as *Prêt aidé à l'accession à la propriété (PAP)* and a *Prêt conventionné* since 1977, a zero interest loan *Prêt à taux zéro* since 1995). Such measures clearly aim at making credit constraints less binding, by decreasing the cost of credit. It supports the idea that households are renters not because they chose it, but because they are not able to become owner.

Since the seminal work by Hall (1978), the literature has broadly investigated the

idea that at least some households are credit constrained in the economy. This empirical question has important theoretical consequences : if households are credit constrained, they can not smooth their consumption over the life cycle, leading to a non optimal consumption path. It challenges the permanent income cycle hypothesis (PIH) and then the Ricardian equivalence which implies that macroeconomic stabilization policies are not effective.

Why are households credit constrained ? Stiglitz and Weiss (1981) indicates that the lack of information on which entrepreneurs are likely to default could explain credit rationing. Banks are likely to discriminate among households those having a high probability to default. Because the bank does not know which households are more likely to default then it has to use proxies such as income and to impose a collateral. What can household do to make the constraints less binding ? A strategy inspired by the signalling literature would be to find a signal that shows that the risk of default is low. If the risk of default is correlated to the risk of separation of the couple, then marriage could be used as a signal of the match quality and then lower credit constraints. The marriage is a good signal of the stability of the couple if it permits to separate stable from unstable couples. As a consequence, it has to be observable and costly. But the cost has to be higher for unstable couples. As marriage represents an additional cost in case of separation, it could be more costly for unstable couples than for stable couples. The idea of marriage as signal has not been investigated in the empirical literature on marriage, although it has been proposed in the theoretical literature on marriage since Bishop (1984). Other signal for the stability of the couple could be investigated, such as children or the duration since the formation of the couple. However, children also represents a cost for both married and unmarried couples, that could lower the chances to be approved for a credit and the duration since the formation of the couple is not observed by the bank. Moreover, the inactivity of the woman could be interpreted as a signal for the commitment of spouses and therefore for the stability of the couple.

However, as children, the inactivity also represents a cost that could lower the access to credit. But it could be interesting to investigate these other characteristics can be interpreted as signal of the stability of the couple.

This paper investigates the link between credit constraints and marriage. Identifying credit constrained households is challenging because credit constraints are not observed. Based on data from the 2001 housing survey in France, I study two types of credit constraints inspired by the literature on credit constraints. Using declarative credit constraints, I study constraints at the extensive margin : are married couples more able to get a loan ? Then I turn to the terms of the credit : are married couples more able to get a better loan ? The loan is described by 6 variables : value (expressed in level or in annual income), downpayment (expressed in level and in proportion of the value of the housing), total cost of the loan and required income. I cannot compare directly the outcomes of married and unmarried couples, as they have different observable and unobservable characteristics. I use matching methods to deal with the differences in observables between married and unmarried couples. The results do not exhibit stronger credit constraints for unmarried couples than for married couples. However, unmarried couples are more discouraged borrowers than married couples. That could be explained by selection in the marriage. On the contrary, married couples look disadvantaged on the credit market. This surprising result could be interpreted as a selection on unobservable characteristics.

The paper is structured as follows. Section 2 presents the existing theories of marriage contracts and section 3 describes how credit constraints are measured in the literature. To my knowledge, these two streams of the literature have never been jointly considered. Section 4 defines the data and the measure of credit constraints. Section 5 explains the estimation strategy and section 6 presents the results. Section 7 concludes.

2 Marriage as a signal

When Becker wrote his seminal work on marriage (1973; 1974), he made no difference between married and unmarried couples. Following his path, marriage and household formation have been treated identically in models for decades. This can be explained by the fact that there were almost no cohabiting couples in the 1970s. The last decades witnessed a change in household formation, with the increase of cohabitation jointly with the increase in the age at the first marriage. As explained by Stevenson and Wolfers (2007), the increase in the number of cohabiting couples is led by two forces : marriage tends to be preceded by a period of cohabitation for a large part of couples and cohabitation tends to become a permanent state for a part of couples - although it is very difficult, if not impossible, to estimate the number of "permanent cohabitation". As a consequence, the number of cohabiting couples in a cross section sample tends to become larger than what it was in the 1970s, especially in Europe. Stevenson and Wolfers estimate that 10.8% of couples are cohabiting in France in 2003, which is twice higher than in the US at the same period. The dramatic increase in the number of cohabiting couples coincides with the increase of out-of-wedlock births in France. 37.2% of newborn babies in 1994 had unmarried parents, 44.7% in 2001 and more than a half since 2006 (INSEE, 2010). Therefore, marriage is not necessarily the stepping stone of the formation of the family in France.

This phenomenon raises many questions on the role of marriage in the couple's life cycle. The idea of marriage as the couple outset tends to disappear. The marriage analysis follows now a choice-based approach. Couples can choose to get married or not, and when they get married. Brien, Lillard, and Stern (2006) propose a model in which cohabiting is a necessary step to observe the quality of the couple in an uncertain environment. Matouschek and Rasul (2008) investigates three reasons of getting married : marriage provides an exogenous benefit, serves as a commitment device, and it is

used as a signal toward the partner. Their analysis of the impact of unilateral marriage on divorce trends tends to support the commitment device hypothesis. It implies that marriage is used in a repeated game to ensure that partners play cooperative strategies.

In an early paper, Bishop (1984) proposes an alternative analysis of marriage : marriage as a signal towards the world. This analysis is also supported by Rowthorn (2002). The idea of marriage as a signal is in the same vein as the theory of signal by Spence (1973). As divorce is costly, the marriage can be viewed as a costly signal of the quality of the couple. The cost is not bear by the couple when getting married (investing in the signal) but if the couple breaks up. Therefore, it can be viewed as a signal of the quality of the couple as the (expected) cost of marriage is higher for poor quality couples. Marriage is a signal toward the rest of the world, whereas the signalling theory of marriage in Matouschek and Rasul suggests that marriage is a signal toward the other partner. But marriage could provide information to economic agents for whom the quality of the match does matter such as economic agents involved in a long term partnership with the couple. Indeed, in a context of uncertainty, before starting a long term partnership with the couple or one of the spouses, the agent could be willing to know if the partner/couple is reliable. Marriage could express the capacity to commit in a long term relationship. For example, marriage could prove the capacity of a partner to get involved, and impact her employability. Korenman and Neumark (1991) finds a wage gap between married and unmarried men, and attribute the "marriage premium" to a selection in marriage.

This paper studies the impact of marriage on credit constraints. When contracting a mortgage, the couple contracts a long term relationship with the bank or the mortgage broker (thereafter both of them are called with the generic word "bank"). If the bank has to pay some costs at bargaining a new loan in case of divorce, it is more likely to lend to stable couples. But stability is not directly observable, thus the banker requires a proxy for stability : marriage could be a such a proxy, especially as the duration since

the couple formation is unobserved. In order to be a good signal, the marriage needs to be observed, which is obviously the case, and costly. But the cost of marriage has to be high enough to induce a separate equilibrium, i.e. stable couples get married and unstable couples do not. So the cost of the marriage should be linked to the risk of splitting. If this assumption is verified, it should avoid reverse causality. Indeed, if couples are aware that they are more likely to be approved for their loan if they are married, even unstable couples could contract a marriage. Therefore, the marriage induces a separate equilibrium if the cost of marriage is high enough to keep unstable couples away from marriage, i.e. if the *Individual Rationality* constraint is verified, indicating that couples reveal their type by getting married.

Of course, the bank is willing to discriminate couples based on their stability only if it is costly to lend to unstable couples. The cost for the bank might arise if the couple breaks up. Several reasons explain the cost of separation for the bank. First, a separation can be very costly, because of moving cost, lawyers, etc. Therefore, agents can be economically weak during the period of divorce, thus increasing the risk of default. The typology of households listed as having an excessive debt in 2001 by the Banque de France [1] indicates that 27% of excessively indebted households are divorced (or separated) whereas 6.5% of the population is divorced (Banque de France, 2002). Moreover, the debt became excessive after a divorce for 16% of them, and for an accumulation of credits for 48% of them. Therefore, even if the risk of default is low in France, it tends to increase after a divorce or a separation. If the couple is economically weak before a separation, the separation could increase the economic burden and then the risk of default. If the risk is large enough, the bank should favor stable couples, and so married couples, if marriage is consider as a signal.

The French survey on households' assets (*Enquête Patrimoine 1998*) provide infor-

1. When they cannot support their debt anymore, households can call the Banque de France to have their debt paid off by the Banque de France. They have then to pay off the Banque de France and they are listed as having an "excessive debt" (Loi Neiertz, 1989).

mation on which households declare having experienced financial problems during the past years. Table 4.1 shows that the proportion of respondants indicating that they experienced some problems is much bigger among households that split during the last years. Especially, 31.8% of respondant having broken up during the last year declare having experience financial problem during the last year, whereas only 8.4% of unseparated couples and 12.2% of singles had such problem. Similarly, 29.7% of respondants having broken up during the last 5 years declare having experienced financial problem for several years. Tables 4.2 points that among respondants experiencing a separation, previously married individuals tend to experience more financial problems than previously unmarried individuals. Among respondants declaring that they experienced financial problems, separated individuals tend to attribute more their financial problems to "personal reasons" (that includes separation) than other couples especially among previously married couples. Although these descriptive statistics do not give clear results on the causality of separation of financial difficulties, they tend to support the idea that individuals are financially weak after a separation.

But, default is the worst case : the separation does not end up in default in most cases. Then, the separation can also be costly even if the couple does not default. There are two classic cases. First case, the couple sells the house when separating and pays off the debt, providing the housing situation gives the opportunity to sell the house. The bank can charge the couple for the penalties in that case[2]. It induces a cost (albeit low) for the bank in terms of time and bargaining when the debt is liquidated. Second case, one spouse wants to buy her part from the other spouse and to stay in the house. In that case, she has to renegotiate the credit with the bank and to contract a new one to buy the other partner's part. This induces some negotiation costs. In all cases, the bank could support indirect costs after a separation with the loss of a consumer. Consumers tend to be reluctant changing of bank, except when

2. The penalties the bank can charge are restricted by the the law (Loi Scrivener, 1978 and 1979)

contracting a credit. As the housing credit are long term credits, they can be used by the bank to attract new consumers. Therefore, the separation and the liquidation of the credit increase the risk of loosing a consumer.

A marital-based discrimination is an important issue in a context of raising cohabitation. If couples have to wait for being married in order to borrow, they would postpone the investment decision. It makes it more difficult to smooth consumption over the life cycle. They could also bring forward their marriage. In an analysis of uncertain match quality *à la* Brien, Lillard, and Stern (2006), it could decrease the mean quality of married couples and then increase divorce rate on the long run. If the bank needs a signal of the quality of the couple, then a decrease in the marriage rate could introduce non optimality on the credit market.

3 Measuring credit constraints

3.1 A general framework defining credit constraints

The definition of credit constrained is straightforward : a household is constrained if it cannot borrow as much as what would be optimal given its intertemporal utility. Therefore, its consumption path is not the optimal over the life cycle, because it cannot borrow the amount of debt that maximizes its intertemporal utility and smooth its consumption. So the determination of who is credit constrained and how much she is constrained requires the observation of how much the couple is willing to borrow. The optimal consumption path is determined by an intertemporal program of consumption. The model is defined in the classical life cycle permanent income model. However, this framework has been challenged since the pioneer papers by Hall (1978) and Hall and Mishkin (1982). They show that the Euler equations derived from the intertemporal model induced by the permanent income hypothesis are violated, supporting the idea that household are credit constrained. Euler equations simply states that the marginal

rate of substitution between current and future consumption is set equal to the marginal rate of transformation, ie how much 1 unit of current money produces in the future.

There are several implications to Hall's finding. First it challenges the permanent income cycle hypothesis (PIH) traduces the Ricardian equivalence, implying that macroeconomic stabilization policies are not effective with PIH. But this hypothesis requires that households are able to smooth their consumption over the life cycle. As explained by Hayashi (1985a), the life cycle permanent income hypothesis need household to be unconstrained. Therefore, if at least some households are credit constrained, macroeconomic stabilization policies could be effective. So, if households are not equally subject to credit constraints, it could be efficient to make policies targeting credit constrained households. Challenging the PIH has been an important motivation in the literature. Then, credit constraints can also impact the housing market. If they are constrained, households cannot move easily and thus, they can not adjust their housing stock to their need. Gobillon and Le Blanc (2002) show that investment in housing is similar to the (s, S) as in classic investment models. Credit constraints decrease mobility on the housing market, inducing market frictions.

The idea of the paper is to explore if unmarried couples are more credit constrained than married couples. Differences in the access to credit between households imply a difference between households on the long run. If credit constraints are more stringent for unmarried households, then the impact of constraints is more important for couples choosing to postpone their marriage. Therefore, it introduces differences that could impact their saving and investment behavior on the long run. As a consequence, the rise of cohabitation could increase the differences between households and impact wealth accumulation during the life cycle.

My measure of credit constraints is inspired by Hayashi (1985b), defining credit constraints as (i) credit rationing, ie they are constrained on quantities : "they face

some quantity constraint on the amount of borrowing" (ii) total cost of the loan is too high : "the loan rate available to them is higher than the rate at which they could borrow"

3.2 Identifying credit constrained households

Following the seminal paper by Hall (1978), Hall and Mishkin (1982) uses Euler equations to study how the consumption is related to the permanent income (using the panel data of the PSID [3]) and transitory shocks on income. They find that consumption is more volatile than income : 80% of consumption obeys the life cycle/permanent income hypothesis, while 20% of consumption is explained by transitory shocks on income. They attribute these 20% to credit constraints. However, they are not able to identify credit constrained households. Identifying who is credit constrained and the impact of credit constraints is difficult because it relies on an unobserved information : the expectation the household forms on its permanent income. As they are not observed, credit constraints have to be derived from proxies.

Proxies are given either by indirect criteria such as income and net-wealth of the household or directly from declarative self reported indicators of constraints. Linneman and Wachter (1989) derived credit constraints from the observation of wealth and the income which defines the maximum home purchase price the household can afford. This amount is compared to the actual value of the housing purchased by the household. If it is close to the maximal price the household can afford, then the household is said to be credit constraint. If not, it is said to be unconstrained. Using their definition of credit constraint, Linneman and Wachter find that 27% (resp. 15.5%) of household are credit constrained during the 1975-1977 (resp. 1981-1983) period in the United States. Hayashi (1985a) imposes the condition that the debt held by the household

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cannot exceed the value of assets that serves as a collateral. If it is, then the household is credit constrained. In an influential paper, Zeldes (1989) splits his sample into low assets and high assets households, arguing that households with large amount of wealth and large wealth-to-income ratio are not credit constrained. On the contrary, Jappelli (1990), Cox and Jappelli (1993), Duca and Rosenthal (1994) on US data, or Chivakul and Chen (2008) on data from Bosnia and Herzegovina consider as credit constrained households reporting they made a request for credit that was turned down. Wakabayashi and Horioka (2005) uses Japanese data on complaints against financial institutions to derive credit constrained households, and Gross and Souleles (2001) exploit data on credit card accounts and use changes in the credit limit and in interest rates to estimate dynamic effects of changes in credit on consumption, denoting binding credit constraints.

Identifying credit constrained households serves several purposes. The first purpose was to define if at least some households are credit constrained and how much households in the economy it represents. Hayashi (1985a) and Zeldes (1989) test if the Euler equation is likely to be violated for household likely to be constrained and not for the unconstrained household. Their consumption behavior tends to support the idea that at least some households are credit constrained. Jappelli (1990) uses declarative information on US data to proxy borrowing constraints. He defined as credit constrained a household whose request was turned down or not fully granted, or if the household did not apply to a credit because it thought that it could be turned down. He finds that 19% of the households are credit constrained. Using a similar proxy, Chivakul and Chen (2008) shows that around 80% of households are credit constrained in Bosnia and Herzegovina in 2001. The second purpose focuses on the impact of credit constraints on economic choices, such as access to ownership. Using US data, Linneman and Wachter (1989) and Duca and Rosenthal (1994) study the impact of borrowing constraints on access to owner occupied housing. Using different

proxies identifying constrained households, both find high and significant impact of credit constrained on home ownership. Cox and Jappelli (1993) estimates the extra amount constrained households would like to borrow. They identify constrained households from replies to direct questions. They are able to model the desired amount of debt from the unconstrained group and extrapolate the result to estimate the extra amount of debt desired by constrained household. They find that highly constrained household would increase their liabilities by 75%. Grant (2003) jointly model supply and demand for credit using a canonical desequilibrium model. He estimates that 26-31% of households are credit constrained and would like to borrow up to 4,000 dollars more.

The goal of the paper is to estimate if unmarried and married couples face different credit constraints. Therefore, I use the classic Rubin framework of evaluation literature in econometrics. I consider marriage as a treatment and I analyze the impact of marriage on credit constraints using econometric tools of the evaluation literature. However, as for papers that study the impact of credit constraints, I don't observe which households are constrained or not. I use different proxies inspired by the literature to derive credit constraints. To derive constraints at the extensive margin, I use declarative responses to questions on rejected application as in Jappelli (1990). To proxy constraints at the intensive margin, I compare the maximum debt a household can afford to the actual debt held by the household, as in Linneman and Wachter (1989). If they are close, I consider that the household is constrained : therefore the amount of debt observed gives the supply side of the loan, because it gives what constrained households were able to get. Among constrained households, I compare how married and unmarried couples perform on the credit market. As this part only consider constrained households, the sample size is drastically reduced.

4 Descriptive statistics

4.1 Data : Housing Survey

4.1.1 The survey

The housing survey (*Enquête Logement*) is a national survey conducted by the INSEE[4] describing the housing stock in France. It is a cross section survey, repeated almost every 4 years since 1970. Information about credit constraints is available in 2001, therefore I use only one cross section of the survey[5]. It provides detailed information on housing characteristics together with a number of household characteristics such as housing status, income, and demographic features. New owners are also surveyed about their debts when they had to contract a loan for their investment. Only debts contracted for housing investment are described.

Macroeconomic forces drive the credit market, especially the interest rate and the housing price. The interest rate for long term housing loans can be approximate by the rate of national bonds (see figure 4.1). The 1997-2001 period witnessed a decrease in the long-term interest rate and an increase in the housing prices everywhere in France. In 2001, the credit market tends to be favorable to investment : the leading interest rate decreases and the monetary aggregate M3 increases, meaning that banks are likely to lend to economic agents. In this context, credit constraints tend to be less binding at the end of the studied period than at the beginning.

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5. Other surveys provide information on debts, such as the survey on assets (Enquête Patrimoine) which is a national survey providing detailed information on households' assets, including debts and housing. The 1998 wave also surveys households on their credit constraints, but only during the last 2 years. I preferred working on the housing survey because the sample is 3 times larger and because the main interesting question for this paper focuses on credit constraints on a larger span (5 years) than the survey on assets (2 years), which increases the size of my subsample of interest. Panel data including information on households debts does not exist in France.

4.1.2 Subsample selection

The sample of the housing survey is representative of the French population. I select a subsample to address the issue of credit constraints on couples. Among the 32,156 households of the initial sample, I keep 2,398 households (or 2,315 with the strict definition of credit constraints - see below for the definitions). The subsample is selected step by step in order to focus on access to owner-occupied housing. First, I keep couples. In order to make sure that the application for a credit was not made by one spouse with another partner, I exclude couples such that one spouse was committed in an other couple 5 years ago. As I want to analyze access to owner occupied housing, I drop all owner couples that don't buy for the first time. Among the remaining sample, 40% rent and 60% are owner. But among renters, some have been credit constrained and other have not. The question on declarative credit constraints permits identifying credit constrained households among renters, during the last 5 years. Therefore I can study households that have been willing to invest in housing during the last 5 years : either they succeed then I identify them because they have a mortgage contracted less than 5 years ago or they failed and they say their application has been turned down. I can also identify discouraged borrowers who declare willing to invest but do not apply for a mortgage, thinking their application could be turned down. So I only keep households that have been willing to invest during the period 1997-2001 (have they fulfilled or not). There are a strict and a broad definition of being constrained. The strict definition only includes households whose application had been turned down. The broad definition adds discouraged borrowers. In my sample, 1,212 households are recent owners, 1,001 did not invest but were not constrained and 102 households (resp. 185) are constrained according to the strict (resp. broad) definition of credit constraints. I want to avoid couples with unknown collateral value. So I drop couples owner of other housing, because the value of the other housing is not surveyed. As I only observe mortgage, I do not know if the household holds other debts. In order to reduce the

risk of measurement error, I drop households with at least one self-employed partner because they are more likely to hold professional debts, and because housing could also be used as a work place. The type of marital contract is likely to be relevant if the female is active. Indeed, if she is inactive, then the debt only relies on the male's income are they eventually getting divorced or not. So I drop couples with an inactive woman. Eventually, for matching reasons, I had to drop couples if the male does not work full time, high income household (more than 12,000 euros a month) and people such that the head of the household is older than 50. The sample selection process is described in table 4.3.

This subsample is very small compared to the whole sample, as it only represents 7.5% (7.2% for the strict definition of credit constraints). But this subsample is likely to be representative of the French population. Indeed, the INSEE (2011) states that in 2000, 21.1% of households in France was refunding a loan. But this includes singles : in 1999, 58.8% of the population lives in couples. Moreover, keeping couples that have been willing to invest in housing once in the last five years reduces dramatically the sample size.

4.2 Credit constraints

Credit constraints can have two impacts on investment behavior of couples :

- at the extensive margin : couples do not borrow at all, either because what they can borrow is not enough to satisfy them or because the bank rejects their request
- at the intensive margin : couples borrow less than what they would like, because the price is too high or they are constrained on quantities

4.2.1 Declarative credit constraints (at the extensive margin)

Estimating the impact of marriage on credit constraints at the extensive margin requires the observation of rejected loan applications.

Credit constraints at the extensive margin are difficult to identify because one needs to distinguish among non borrowers those who actually applied for a loan and were rejected from those who did not. Figure 4.2 summarizes the application process. Couple may or may not want to invest in housing, but this is not directly observed in the data. This information can be derived from the observation of couples that declare having applied for a mortgage or having been discouraged. 60% of unmarried couples and 69% of married couples are willing to invest in housing. Most couples need to borrow at least part of the value of the housing : on the period 1997-2001, I do not observe any credits for only 4% of first owner couples, including both non response to the debt questionnaire and those who could afford their investment without borrowing. So application for a loan is considered as a necessary step of the investment. I refer as discouraged borrowers those couples that, while willing to invest in housing, don't apply because they think their loan could be rejected. Discouraged borrowers are answering "Yes" to the question *"Was there any time in the past 5 years that you (or your husband/wife) thought applying for a credit at a particular place but changed your mind because you thought you might be turned down ?"*[6] The proportion of discouraged households is a bit higher for unmarried couples : 4% of them are identified as discouraged while 3.1% of married couples are discouraged borrowers. Among those applying for a credit, rejected applications can be identified. Constrained borrowers are those answering "Yes, rejected" to the question *"Was there any time in the past 5 years that you were rejected for a loan by a mortgage broker or a bank, or you were*

6. Translation for : *"Au cours des 5 dernières années, y a-t-il eu un moment où vous/votre conjoint avez envisagé de demander un crédit auprès d'un organisme, mais ne l'avez pas fait parce que vous pensiez que ce crédit vous aurait été refusé ?"*

approved for a lower amount than what you asked ?"[7] The rejection rate (5.2%) is a bit higher among unmarried couples than among married couples (4.0%).

Credit constraints can be strictly defined as credit constraints directly induced by the mortgage broker, excluding the discouraged borrowers. Following Jappelli (1990), a broader definition of credit constraints includes direct rejected applicants and discouraged borrowers. Using this broad definition, 9.0% (resp. 7.0%) of unmarried (resp. married) couples are constrained. The strict definition is more appropriate to the goal of the paper, which is to estimate the direct impact of being married. However, as discouragement is indirectly bank-induced, the impact of marriage using the broader definition is also estimated.

Constrained and unconstrained couples are described in table 4.5. Whatever the definition of credit constraint, unconstrained couples tend to be richer, to work full time, to be more educated and the spouses more often work in the public sector than constrained couples. The differences are straightforward since the bank is more likely to approve the application of wealthier couples, who tend to work more and to be more educated because education increases income in the life cycle. Moreover, public employment is more stable than private employment. This results are confirmed by the regression of the dummy for credit constraints on the covariates presented in table 4.7 : richer and educated households are less likely to be constrained, but hte sector of employment does not impact credit constraints.

4.2.2 Defining credit constraints at the intensive margin

Credit constraints at the intensive margin, i.e. how much couples can borrow compared to how much they would like to borrow are not directly observed. Even if the

7. Translation for *"Dans les cinq dernières années, est ce qu'un organisme de prêt, une banque , vous a refusé une demande de crédit, ou vous a accordé un crédit d'un montant inférieur à celui que vous demandiez ?"*

amount of money borrowed by the household is observed, this amount does not directly give how much the household is constrained. Indeed, it reflects how much unconstrained couples demand and how much constrained couples were given. Grant (2003) proposed to model the observed credit using a canonical desequilibrium model as in Fair and Jaffee (1972). The market for credit is composed of a demand side and a supply side. On the demand side, the household wants to borrow d_i. On the supply side, the bank agrees to lend s_i to this household. The observed credit y_i is the minimum of them :

$$y_i = d_i + c_i(s_i - d_i) \text{ with } c_i = \mathbb{1}\{s_i < d_i\}$$

The estimation of such models requires excluded variables both for the supply and for the demand for credit. However, estimating the impact of marriage on credit constraints at the intensive margin does not require information on both sides of the market. It only requires the observation of how much the bank is likely to lend to a married couple compared to an unmarried couples. This difference could be studied if s_i were observed for married and unmarried couples. The supply side s_i might be observed for couples for whom the credit constraint is likely to be binding. Therefore, I use a classic splitting sample strategy in the literature, based on observed assets : I only examine households that I consider being constrained because they indicate how much a constrained household is able to get, so it indicates the terms of the loan for credit constrained household at the intensive margin.

When investing in housing, the household buys a house of value V, partly with its downpayment D and the mortgage M, such that $V = D + M$.

As explained in Linneman and Wachter (1989) and Gobillon (2008), credit constraints stem from a two-fold rule : on wealth and on income. First, households should have a downpayment D, which is greater than a part a of the value of the house. So $D \geq aV$. This constraint is binding if the household can not borrow more than $\overline{M}^D = \frac{1-a}{a}D$.

Second, the annual mortgage payment cannot be higher than a part $\overline{e}$ of the income. e is called the effort rate. When borrowing at a rate r, for a N-year mortgage, the household yearly refunds $R = \tilde{r}M$, with $\tilde{r} = r\frac{(1+r)^N}{(1+r)^N-1}$ [8]. Denoting I the year income, this constraint imposes that $R \leq \overline{e}I$. It is binding if the household can not borrow more than $\overline{M}^I = \frac{\overline{e}I}{\tilde{r}}$. Taken together, the two constraints imply that the maximum value a household can borrow is :

$$\overline{V} = D + \max\left(\frac{1-a}{a}D, \frac{\overline{e}I}{\tilde{r}}\right)$$

For each household, I compute the maximum amount it can borrow when the constraint on income is binding. $\tilde{r}$ is computed using the mean r observed for the year the loan is contracted and using as N, the duration of the main loan (determined by the most important debt) hold by the household. $\overline{e}$ is fixed to an arbitrary value 0.3, which is the maximal effort rate approved by state-supported loans. Linneman and Wachter (1989) fix $\overline{e}$ to 0.28. Then I consider as likely credit constrained household those whose debt is higher than $0.85\overline{M}^I$. I chose 0.85 in order to satisfy two constraints : I want to keep couples likely to be credit constrained, but I need my subsample to be as great as possible. According to that definition, 33% of married couples and 31% of unmarried couples are credit constrained.

Table 4.6 summarizes the credit held by households, depending on their marital status. Notice that the number of indebted couples is lower than the number of unconstrained household detected before. This could be explained if some couples apply and are approved for a loan but they do not invest. Constrained households are more indebted than unconstrained household : they hold a higher debt and the debt represents 3.84 years of annual income, for 2.66 years for unconstrained households. The

8. The condition to determine the annual mortgage payment is that the sum of annual payment should be equal to the value of the loan the year it falls due. So, R is determined such as $R + (1+r)R + \cdots + (1+r)^{N-1}R = (1+r)^N M \Leftrightarrow \sum_{t=0}^{N-1}(1+r)^t R = (1+r)^N M \Leftrightarrow \frac{(1+r)^N-1}{r}R = (1+r)^N M$

constraint on downpayment does not seem binding for all households : 22.2% of couples do not report any downpayment when contracting their mortgage. The downpayment represents 13.9% of the house value for constrained couples, but 21.4% for unconstrained couples. In France, the State supports access to owner-occupied housing by proving zero-rate loans (*Prêt à Taux Zéro*, denoted PTZ below). This loan is often considered as personal downpayment. It can be refund either directly or once the main mortgage is refunded. As so, it is considered as shifting personal savings over time. Including PTZ in downpayment decreases the proportion of couples without downpayment to 9.8% for constrained couples and 15.6% for unconstrained couples. Then, downpayments represent 24.4% of the housing value for constrained household and 26.3% for unconstrained households. The total cost of the loan represents the ratio of what is refunded on the initial debt. The cost is approximatively 1.5 and similar for constrained compared to unconstrained couples. By definition of credit constrained, the effort rate is much higher among constrained couples than unconstrained couples. Therefore, constrained households tend to borrow more than unconstrained households, with lower downpayment. But the cost of credit is similar for both types of couples. They contract more State supported loans.

Table 4.4 describes constrained and unconstrained households at the intensive margin. Among indebted households, constrained households are richer and are more educated, and females are less likely to work part time than unconstrained households. The constrained spouses less often work in the public sector. These results are confirmed in the regression of the characteristics of the debt on the households characteristics and the debts characteristics in the column (1) to (5) in the table 4.8 and table 4.9. Both tables describe the correlation between the outcome and the caracteristics of the household and the debt. They are different as the sets of characteristics are different. Table 4.8 uses discretized variables while table 4.9 uses continuous covariates.

The value of the debt is impacted positively by the income and the characteristics of the debt (column (1)). The cost of the debt is negatively impacted by the income, the percentage of downpayment and the number of children, but positively by the amount of the debt and if the female works part time. Men working in the public sector impact positively the cost, but women working in the public sector impact negatively the cost (column (3)). The amount of downpayment is positively correlated to a higher income and higher education of the women, but negatively by the number of children (column (4)). The percentage of the value paid with the downpayment is positively correlated to the amount of downpayment and to the number of children and negatively to the cost and to the amount of the debt (column (5)). Therefore, a higher income is correlated to a higher debt, but also to a higher downpayment. The higher the part of the value is explained by the downpayment, the lower the debt is. The total cost of the debt tends to decrease with the amount of the debt, and as a consequence with the percentage of downpayment.

4.3 Married and unmarried couples

Constraints at the extensive margin are measured on a different subsample than constraints at the intensive margin. Indeed, it includes all couples that are willing to invest in housing. Therefore, it includes constrained couples that are not able to access ownership. But it also includes households that eventually give up getting a loan or that have not contracted the loan to the date the survey is made. Therefore, I define two samples depending if constraints at the extensive or at the intensive margin are at stake.

Table 4.5 describes the characteristics of constrained and unconstrained households according to the strict and the broad definition of credit constraints at the extensive margin, depending on their marital status. Married couples tend to be older, richer, and have more kids than unmarried couples, are they constrained or not. The unmarried

female works more full time and has higher diploma than her married counterpart. Among unconstrained couples, unmarried male are more educated than married. These characteristics are confirmed by columns (5) and (6) in table 4.7 that give the regression of a dummy "married" on the household and the debt characteristics.

Table 4.4 summarizes the characteristics of constrained couples at the intensive margin, depending on their marital status. Married couples tend to have similar income, be older and have more kids than unmarried couples. Both unmarried female, work more in the public sector and male are more educated than their married counterparts. This results are confirmed by column (6) in tables 4.8 and 4.9. It also denotes that married couples face higher costs of credit and are less indebted than unmarried couples.

As presented by figure 4.2 and table 4.6, married and unmarried couples tend to have similar access to mortgage although they have different observable characteristics. These characteristics are likely to impact credit constraints : income for obvious reasons, diploma impacting the permanent income and kids representing a cost for the couple. The analysis of characteristics impacting credit constraints in the above sections shows that married couples share characteristics that indeed impact credit constraints : higher income, lower education and older female.

The issue is then to understand if being married directly impact credit constraints, compensating differences in observable characteristics or if being married has no impact on credit constraints, as descriptive statistics suggest. The next section corrects for selection on observables using matching methods.

5 Estimation strategy

5.1 Roy-Rubin causal model

The goal is to estimate if married couples benefit from a reward that makes them less credit constrained than unmarried couples. The impact of marriage on credit constraints could be analyzed using the classic Roy-Rubin causal model, considering marriage as a non random treatment. Let y_i^1 be a measure of access to credit by a couple i when married, and y_i^0 the measure of access to credit if unmarried. Let m_i be a dummy that equals one if the couple is married. The impact of marriage on the access to credit is simply given by $y_i^1 - y_i^0$. A classic statement in this literature is that both y_i^1 and y_i^0 can not be observed at the same time, preventing from identifying the impact of marriage. Indeed, it is not possible to observe the *same* couple both married and unmarried. Only y_i is observed, with :

$$y_i = y_i^0 + m_i(y_i^1 - y_i^0)$$

y_i measures the access to credit. Therefore, when measuring credit constraints at the extensive margin, y_i is a dummy indicating if the application for a credit has been turned down by a mortgage broker (or, using the broad definition : if the application was rejected or if the couple is a discouraged borrower).

The measure of access to credit at the intensive margin can take different forms. Following Hayashi (1985b), credit constraints could be defined as

(i) credit rationing, "they face some quantity constraint on the amount of borrowing", in which case constrained couples would be able to borrow a lower amount even if they face the same loan rate.

(ii) "the loan rate available to them is higher than the rate at which they could borrow", in which case the total cost of holding a debt is higher for a fixed amount of debt.

To these two measures, I also consider a third one :

(iii) the condition on the value of the required downpayment is made more binding for constrained households, i.e. they need a higher downpayment (or the loan-to-value ratio must be lower) for constrained couples, for the same mortgage.

The goal of the paper is to identify the impact of being married on the different outcomes describing credit constraints.

5.2 The statistical problem of selection on observables

Identification and counterfactual Estimating the impact of marriage can be framed within the potential outcome approach. The potential outcome y_i^0 (resp. y_i^1) is not observed for a married (resp. unmarried) couple. It makes it impossible to observe the individual effect of the marriage. Extremely strong assumptions are needed to infer individual effect, because it depends on the joint distribution of y_i^1 and y_i^0. At the contrary, the average effect of marriage could be derived under less stringent assumptions. The average treatment effect on married couples, $E(y^1 - y^0|m = 1)$ depends on the marginal distribution of the potential outcomes and not on the joint distribution. But $E(y^1 - y^0|m = 1) = E(y^1|m = 1) - E(y^0|m = 1)$ and $E(y^0|m = 1)$ can not be observed. The main idea is to approximate the counterfactual in the data. I present below the 8 approximations for the impact of credit constraints I have computed. (To make the discussion clearer, I identify each approximation computed in the result part in italic.)

The idea of the approach consists in constructing a suitable comparison group. A natural proxy for married couples is unmarried couples. The simplest estimator for the impact of marriage is thus a *simple difference* (est. 1) of the means of the outcomes between married and unmarried couples :

$$\overline{y^1} - \overline{y^0}$$

However, as explained in section 4.3, married and unmarried couples have different observable characteristics. This could be related to a life cycle description of the couple, explaining why married couples tend to be older (and then wealthier) and have more kids. Therefore, the simple difference estimator could attribute to the marriage an impact of covariates that are not equally distributed in the two subpopulations.

Unconfoundness As a consequence, the approach consists in defining a fixed set of covariates justifying the unconfoundedness hypothesis. As stated by Imbens and Wooldridge (2007), "unconfoundedness, a term coined by Rubin, refers to the case where (non parametrically) adjusting for differences in a fixed set of covariates removes biases in comparisons between treated and control units, thus allowing for a causal interpretation of those adjusting differences". So it refers to the possibility to embody all the difference in terms of potential outcomes, between married and unmarried in a fixed set of covariates. Of course, a marriage is not a social neutral institution, it is hard to believe that differences between married and unmarried couples could be cleaned up with a set of observed variables. But in terms of potential outcomes, it means that the joint distribution of potential outcomes is independent from the marital status conditional on other relevant characteristics for the bank, such as income or wealth. This assumption is more believable. It means that the banker, having observed relevant characteristics such as age, employment status, income, etc. determines the outcome for married and unmarried couples, without taking into account the unobserved reasons that make the married couples different from unmarried couples. This assumption does not hold if there is an unobserved characteristic relevant for the banker and highly correlated to the marital status - such as social background -, that are observed by the banker and not the econometrician.

The main idea of the identification strategy relies on the assumption that a set of fixed covariates X is observed by the econometrician and justifies the unconfoundedness

assumption. This set of variable is such that

$$(y_i^0, y_i^1) \perp m_i | X_i \tag{5.1}$$

This equation traduces the "conditional independence assumption" (thereby named CIA) or ignorability assumption. This assumption is the cornerstone of the identification. Indeed, under the assumption 5.1, the average treatment effect on the treated (ATT) is identified :

$$\begin{aligned} ATT = E(y_i^1 - y_i^0 | m_i = 1) &= E\big(E(y_i^1 - y_i^0 | m_i = 1, X_i)\big) \\ &= E\big(E(y_i^1 | m_i = 1, X_i) - E(y_i^0 | m_i = 1, X_i)\big) \\ &= E\big(E(y_i^1 | m_i = 1, X_i) - E(y_i^0 | m_i = 0, X_i)\big) \end{aligned}$$

Similarly, the $ATU = E(y_i^1 - y_i^0 | m_i = 0)$ (average treatment on the untreated) can be identified.

Control regression approach Under the assumption that the impact of the treatment is homogenous in the population, the *controlled regression* (est 2.) identifies the impact. Indeed, if $y_i^0 = \alpha + \beta X_i + \varepsilon$ and if the impact of marriage is supposed constant, then, y_i can be written $y_i = \alpha + \tau m_i + \beta X_i + \varepsilon$, assuming $\varepsilon \perp X_i$. This impact can be estimated by a simple OLS regression. But the OLS regression gives a parametric form for the impact of marriage, and it does not take into account the common support condition. Therefore, it extrapolates the impact of marriage on units that are not likely to be married (or unmarried). This condition is commented below. The two estimators proposed so far are classic in this literature, so I consider them as my baseline estimates.

Another approach addressing the question of the impact of a treatment in the literature is the *Oaxaca-Blinder decomposition* (est 3.). The idea is that the treatment do not have an impact *per se* but through different rewards of the same characteristics. So it proposes to disentangle in the determination of the outcome what comes from a difference in the distribution of the covariates (unmarried couples are younger) from a difference in the reward of the covariates (being 30 years old does not impact credit constraints the same way when married or unmarried). Different rewards of the covariates are often considered as a source of discrimination. It supposes that :

$$\begin{aligned} y_i^1 &= X_i^1\beta^1 + \varepsilon_i^1 \\ y_i^0 &= X_i^0\beta^0 + \varepsilon_i^0 \\ \overline{y^1} - \overline{y^0} &= \underbrace{\overline{X^1}(\beta^1 - \beta^0)}_{\text{rewards}} + \underbrace{(\overline{X^1} - \overline{X^0})\beta^0}_{\text{endowments}} \end{aligned}$$

The ATT could be approximate by the "rewards" part of the equation, because it represents the rewards of being married, keeping the characteristics constant.

Both approaches (controlled regression and Oaxaca Blinder) suppose constant treatment effect and extrapolate the relationship between the y_i and the m_i and X_i outside the common support.

Common support and matching The common support assumption states that both treated and untreated have to share common traits in order to estimate the impact of the treatment. The common support assumption requires that for each combination of X (strictly defined) there are married and unmarried couples. Indeed, if some values of X_i are only observed for $m_i = 1$ then the coefficient on m_i could be biased because part of the impact of X_i on y_i is captured by m_i. This problem is likely to bias the results if there is no variation in the marital status for some combination of the X_i,

e.g. if wealthiest or oldest couples are all married. Therefore, the impact of marriage should be estimated on a subsample that provides variation in the treatment status for all combination of X_i. This problem sheds light on which units among treated and controlled (i.e. married and unmarried) should be compared. This implies adding an assumption of the joint distribution of the covariates and the marital status, called the common support assumption, often written as [9] :

$$0 < Pr(m_i = 1|X_i) < 1 \tag{5.2}$$

Indeed, if $Pr(m_i = 1|X_i) = 1$ I only observed some married couples for some combination of X. On the common support, I can observe married and unmarried couples for each combination of X.

In order to estimate the ATT, the approach of matching consists in reweighting the untreated units to make them similar to treated units. For the ATU, the approach consists in reweighting treated unit to make them similar to untreated units. The number of married couples is more important than unmarried couples. Therefore, the estimation of the outcome for treated units is likely to be more precise than the estimation of the outcome for untreated units.

Then, the idea is to compare a simple difference between the average outcome for treated and the weighted average outcome for untreated. There are different ways to compute the weights. The most intuitive way consists in a one to one matching of married couples to unmarried couples with the same characteristics and to give them a unit weight (zero for unmatched). Notice that under a strong definition of the ignorability assumption, this is suffisant to estimate the individual effect of marriage. Indeed :

9. Only $Pr(m_i = 1|X_i) < 1$ is necessary to identify the ATT and $0 < Pr(m_i = 1|X_i)$ for the ATU. As I'm willing to estimate both of them, I imposes both restrictions at the same time.

$$\begin{aligned}
\tau &= E(y_i^1 - y_i^0 | m_i = 1) \\
\tau(x) &= E(y_i^1 - y_i^0 | m_i = 1, X_i = x) \\
&= E(y_i^1 | X_i = x, m_i = 1) - E(y_i^0 | X_i = x, m_i = 0) \\
\tau &= E(\tau(x))
\end{aligned}$$

However, this estimation is infeasible if the dimension of X is large - and the sample size is finite, because it requires to observe both married and unmarried couples in each cell defined by the X. It is possible to use a metric that measure the distance between two combination of X. The *Mahalanobis metric* (est. 4) matches units on a metric that measures the distance in terms of covariates between a treated and an untreated unit. It permits choosing the closest match in the sense of that metrics.

Propensity score matching Rosenbaum and Rubin (1983) showed that it is not necessary to condition on all covariates. Conditioning on the propensity score (i.e. $p(x) = P(m_i = 1 | X_i = x)$) is sufficient to remove the biases due to observable covariates, and unobservable characteristics, if they are perfectly correlated to observable characteristics. Therefore, the impact of the marriage can be estimated by comparing the outcome between a married couple and a matched unmarried couple, i.e. a couple having a similar values of the propensity score. The use of the propensity score makes the matching rely on less stringent conditions than the one to one matching, but there is still a need of common support of the propensity score : it means that each level of the propensity score is likely to be observed among married and unmarried couples. So even if there are only married or unmarried couples for some combination of X, there is enough overlap in the X to suppose that this combination could be observed among the other group.

The propensity score matching estimator compares the mean outcome of married couples to the mean outcome of matched counterfactuals. There are different methods to match individuals. In this paper I first use the *nearest neighbors matching* (est. 5), that uses for each treated unit the closest untreated units in terms of propensity score (five neighbors in this case). Then I use *kernel matching* (est 6.) that for each treated unit mimics a counterfactual attributing different weights to each untreated observation.

Which matching estimator should be chosen ? The choice has to be led by the effectiveness in eliminating the bias and efficiency considerations. If the true propensity score is known, all methods are effective at eliminating the bias. However, when it is not known (as in most situation in applied economics), it has to be estimated (often using a logit or probit specification) and the efficiency is not clear. Hirano, Imbens, and Ridder (2003) (thereafter call HIR) proposes an efficient reweighted estimator based on the propensity score.

Reweighting estimators The methods presented so far are all based on the same idea : reconstruct for each treated unit a suitable comparison unit using untreated units. But as I am interested in moments, I can also use the propensity score as weights in order to create a balanced sample of married and unmarried observations, as suggested by HIR. The matching estimators presented above try to mimic the counterfactual for each treated unit. The reweighting method proposed by HIR reweights all untreated units in the sense that it mimics the mean of the distribution.

They show that the estimator

$$\widetilde{\tau}_{ATE} = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{m_i y_i}{\hat{p}(X_i)} - \frac{(1-m_i)y_i}{(1-\hat{p}(X_i))}\right)$$

is an unbiased estimator of the average treatment effect, $ATE = E(y_i^1 - y_i^0)$, where $\hat{p}(X_i)$ is the estimated propensity score. As the weights for treated do not add

up to one [10], they have to be normalized. Similarly, they have to be normalized for the untreated.

Similarly, the $ATT = E(y_i^1 - y_i^0 | m_i = 1)$ can be approximated with :

$$\widetilde{\tau}_{ATT} = \sum_{i=1}^{N} \frac{\hat{p}(X_i)}{\sum_{j=1}^{N} \hat{p}(X_j)} \Big(\frac{y_i m_i}{\hat{p}(X_i)} - \frac{y_i(1-m_i)}{(1-\hat{p}(X_i))} \Big)$$

which is just a *reweighted simple difference* (est. 7). Hirano, Imbens, and Ridder (2003) show that this estimator is efficient, with a fully nonparametric estimator for the propensity score. The weights have to be normalized to add up to one for treated units and for untreated units. Therefore, the estimator can be rewritten :

$$\widetilde{\tau}_{ATT} = \sum_{i}^{N} \Big(\frac{m_i y_i}{\sum_{i=1}^{N} m_i} - \frac{W_i y_i}{\sum_{i=1}^{N} W_i} \Big)$$

with $W_i = \frac{(1-m_i)*p(X_i)}{1-p(X_i)}$

This is exactly similar as a WLS estimator of β is the model

$$y_i = \alpha + \beta m_i + \varepsilon$$

with weights λ_i such as :

$$\lambda_i = \sqrt{\frac{1}{\sum_{j=1}^{N} \hat{p}(X_i)} \Big(m_i + \frac{\hat{p}(X_i) * (1-m_i)}{(1-\hat{p}(X_i))} \Big)}$$

This regression model could be extended adding covariates to the regression function to improve the precision (*weighted control regression*, est. 8), without loosing consistency.

The two estimators (including covariates or not) are based on the idea that the propensity score can be used to reweight outcomes in order to correct for the bias induced

10. In expectation, they do. But the sum is very likely to be different from 1 in finite samples.

by the X. HIR show that this estimator is efficient. The ATU can be estimated similarly.

If the ignorability assumption is assumed to be true, why are estimation methods based on the propensity score (matching or reweighting) interesting compared to simple controlled regression ? The crucial assumption is the common support assumption. The goal of the estimation of the propensity score is of course the estimation of a measure of how close are treated and untreated units, but also to get rid off "outliers" in terms of treatment. By trimming part of the support for which only treated or untreated units are observed, the econometrician drops observations that are not relevant in the sense that for this combination of X, there is no variation in the treatment status. Regression methods extrapolate the results to the off support observations relying heavily on parametric forms. Matching and weighting methods give a non parametric estimation of the impact of treatment, while the ignorability assumption gives a causal interpretation to the estimator. In practice, a parametric propensity score is although estimated, but the impact of the treatment on the outcome is not parametric.

Therefore, matching and reweighting are methods to correct the selection on observables. As explained in Heckman, Ichimura, Smith, and Todd (1998), there are three potential sources of bias in classical OLS regression when estimating the impact of a treatment on an outcome :

(i) Different support of X between controlled and treated units could induce bias.

(ii) The difference of the distribution of X between the two groups over its common support could induce bias

(iii) Selection on unobservables could of course induce bias. But this means that the CIA assumption does not hold in that case, challenging the required assumption of ignorability of the treatment.

All the estimators presented above tend to eliminate the bias due to (i) and (ii). As there is no clear reason why one estimator could be better at reducing the bias in

finite sample than the others, I give estimates using all of them. I compare the results to the classic control regression models.

5.2.1 Basic assumptions

The basic assumptions necessary for a causal interpretation of the impact of treatment are ignorability and common support. I claim these assumptions are likely to be verified when studying the impact of marriage on credit constraints, providing that a set of relevant covariates is available. Relevant covariates mean here that the covariate are correlated to marital status and impact the credit decision of the banker.

Credit constraints result from the decision of the bank. Therefore, when addressing the question of ignorability, one has to think about the covariates that could matter for the decision of the bank. The main covariates are the income, the wealth and characteristics on employment (as stated previously in section 4.2), because the main preoccupation of the bank should be to avoid the risk of default. Ignorability means that the joint outcomes are independent from the choice of getting married of the couple, conditional on these covariates. In other words, what is important is that the unobserved part of the decision of the bank to approve the credit is not correlated to the unobserved part of the decision of the couple to get married. This assumption is likely to be violated if there are some omitted factors correlated to marital status, that matter for the decision of the bank, observed by the banker but not by the econometrician and which are not completely cleared up by the set of covariates. This kind of omitted factor could be the social background of the couple. There is no way to test for that kind of factors but they can be partly correlated to income, education and wealth, that are controlled for. More over, this is not clear that such a factor would influence the bank *per se*. This is more likely that they are other signal for the seriousness of the couple. But in that case, I interpret as an impact of the marriage the impact of this

other factor.

The set of covariates used to study the impact of marriage on credit constraints at the extensive margin includes income and some demographic characteristics : male age, female age, annual income of the household (I cannot distinguish the male's from the female's income), number of kids, female education, male education, a dummy indicating if the female works part time, and dummies indicating if the spouses work in the public sector. The income is the current income, as it is not possible to measure the permanent income although the theory predicts that the bank takes into account the permanent income. However, the approximation is not bad if the current income reflects well the permanent income. Unfortunately, I observe downpayment only when the household gets its loan, so I don't observe it for rejected couples. So I do not have any proxy for the wealth of constrained households. This is likely to bias my results, as it is an important covariate. However, it will bias the result if it is highly correlated to the marital status. On the sample of new owners, I can compare the amount of downpayment for married and unmarried couples (table 4.6). The downpayment is similar for married and unmarried couples when not constrained, but unmarried couples tend to have an higher downpayment than married couples, among constrained couples (the difference is slightly significant at a 10% level, see table 4.18). This is not clear if the difference in downpayments between married and unmarried couples would be greater for constrained (at the extensive margin) than for constrained (at the intensive margin) couples. If so, it is likely to bias downward my results : downpayment should facilitate the credit and unmarried couples have a higher downpayment. Moreover, if the wealth is strongly correlated to the covariates including in the matching procedure, then the bias is removed by conditioning on the set of observable covariates. I do not include in the set of covariates the size of the life town because this is highly endogenous for those who access to ownership. I do not include neither some covariates that might

seem important for the banker, such as the distribution of income among the partners that could be informative but it is not observed in the data. However, I included a dummy indicating if the female works part time as a proxy for a large difference in the male's and the female's income.

The set of relevant covariates to address the issue of credit constraints at the intensive margin depends on the outcome. Following Hayashi (1985b), I study six different outcomes

1. The total amount borrowed in level, in order to detect any restriction on quantities
2. The total amount borrowed, calculated in years of income
3. The value of the downpayment, in order to check if the second constraint is more binding for unmarried couples
4. The part of the value of the house financed by the downpayment, to check how binding the other constraint is
5. The level of income, in order to check if the required level of income is different for married and unmarried couples for a fix debt
6. The total cost of the loan, in order to detect any restriction in prices.

I define a set of covariates composed of demographic characteristics as well as education and employment status : a dummy if the female works part time, a dummy indicating if the male has a diploma higher than high school, same for female, number of kids, male's age, female's age, and dummies for the sector of activity. This set is common to all outcomes. As for the computation of the propensity score for the study of constraints at the extensive margin, the repartition of income among the household is not included in the sets of covariates. Each of the six outcomes (except the total amount borrowed, calculated in years of income) are included in the set of

fixed covariates when it is not the explained variable. So the set of covariates included for the computation of the propensity score is different for each covariate. As this set of variables sums up all the key characteristics determining the access to credit, the ignorability hypothesis is likely to hold.

The common support would be unlikely if there was no variation in the life cycle among couples. For example, if all couples were to get married at age a. In that case, the common support assumption could not be verified because at age $a+1$, all couples are married and there are not unmarried couples. This means that the assumption requires some heterogeneity in the life cycle dynamic of couples, with some getting marrying older than other, having kids at different ages, etc. This assumption is likely to hold because marriage is not a neutral institution and there is heterogeneity in the preferences of couples toward marriage. But these preferences should not be correlated to the decision of the bank to approve a credit because it would violate the ignorability assumption.

6 Results

6.1 Estimation of the propensity score

As explained in section 5.2, all the estimators for the ATT or the ATU (matching kernel and nearest neighbors, weighted estimators) rely on the estimation of the propensity score, except the matching estimator based on the Mahalanobis metric. The propensity score is estimated parametrically, using a logit specification.

Two sets of covariates are being used. They include the same variables, but the first set (Set 1 thereafter) includes discretized continuous covariates (age, income) while the second set (Set 2) includes the continuous covariates. Introducing discrete covariates is useful because it allows for non linearities in the impact of X on m_i. For

each outcome, I test both sets of variables.

The estimation of the propensity scores for the study of constraints at the extensive margin is given by tab 4.10. The estimation confirms what the descriptive statistics illustrates : married couples are richer, more educated, have more children, are a little older and more often works in the public sector. The estimation of the propensity scores for the study of constraints at the intensive margin is given by tab 4.11 and 4.12. The sample of indebted households likely to be constrained is very small compared to the sample of households willing to invest. As a consequence, the estimation of the propensity score gives less clear results. However, it confirms that constrained indebted married couples have more children, the male more often works in public sector and the female is older and they tend to be more educated than indebted unmarried couples.

In order to ensure the common support assumption (equation 5.2), I drop the extreme values of the common support, i.e. those observations which propensity score is greater than 95% or lower than 0.15%. Figure 4.3 draw the distribution of the propensity score (treatment=marriage) for married and unmarried couples. This propensity score is computed on the subsample used to study the credit constraints (strict definition). The propensity score for the study of the credit constraints (board definition) is not exactly the same because the population is not the same. Anyway, as the sets of covariates are strictly identical and the populations are very close, the distribution of the propensity score is very close to this one. Although the distribution is not identical, the common support assumption is clearly verified here, because for each level of the propensity score, there are both married and unmarried couples. The propensity scores obtained with each set of variables are very similar to each other.

The study of credit constraints at the intensive margin is based on an other subsample of households, the sample of indebted households. Figure 4.4 draw the distribution of the propensity score (treatment=marriage) for married and unmarried couples. This propensity score is computed on the subsample used to study the total cost of

marriage (individual characteristics + debt, downpayment, % of downpayment). This figure only gives one distribution for one propensity score as an example, although I estimate one propensity score for each outcome. The common support assumption is verified for levels of the propensity score greater than 0.5. This is why I only keep observations having a propensity score greater then 0.5. Then, the distribution are quite similar. This tend to show that indebted couples are quite similar on observables, are they married or not. The shape of the propensity score depends on which covariates are included in the estimation. Therefore, as the set of included covariates depends on the explained outcome, the propensity score is different for each outcome. However, as the set of covariates is very similar in each case, there are similar to the propensity score presented in figure 4.4.

For each outcome, I compute two impacts of marriage : the average treatment effect on the treated, where being treated is being married (ATT), and the average treatment effect on the untreated, i.e on the unmarried (ATU). Matching estimators are non parametric estimators : the two impacts are not necessarily the same in both population with matching estimators. They are the same with simple difference and OLS estimation as these methods suppose constant treatment effects. The ATT gives the impact of marriage for those who got married, and the ATU gives the impact of marriage for the unmarried, if they were to get married. I expect that the ATT gives that married couples tend to have a greater access to credit and better terms. Similarly, I expect that the ATU indicates that unmarried couples would not benefit from being married.

The estimation of the propensity score is very important as it defines the weights attributed to the untreated units to make them similar to the treated unit. Then, the different estimators differ in the way they use the propensity score to compute the

weights. So, any difference in the estimations comes from the different weights. Figure 4.5 and 4.6 compare the weights attributed to the untreated unit as a function of the propensity score by each estimator. For comparison reasons, the matching weights are normalized to sum up to one. The Mahalanobis weights are clearly less precise and give more weight to untreated units unlikely to be treated (for who the propensity score is low) than the estimators based on the propensity score. The HIR and kernel weights are very similar, except for high values of the propensity score. The HIR and the nearest neighbors weights are similar, but the nearest neighbors introduce more variation at each level of the propensity score.

The goal of the matching is to define weights that correct for the bias induced by the differences in the observable variables between married and unmarried couples. So a good test is to compare married to reweighted unmarried. The two population should be similar after reweighting. I perform a χ^2 test for the balancing of the two populations. As the set of covariates is different for each outcome, I have estimated a propensity score for each outcome. Moreover, the χ^2 test is weights specific, so I have to compute one test for each weight and propensity score. As a consequence, I have performed estimators using 128 set of weights : for each outcome : I need to test for the 2 outcomes at the extensive margin, because the population are different and for the 6 at the intensive margin because the set of covariates includes for each outcomes other features of the debt. I test 2 sets of variables (discrete and continuous), I compute 2 treatment effects (ATT and ATU), using 4 set of weights (nearest neighbors matching, kernel matching, mahalanobis metric, HIR weights). There is no reason *a priori* that the sample would be balanced for each of them after reweighting. Table 4.13 shows the p-value of the χ^2 tests of overall significance of the difference between covariates after reweighting. Although the reweighting sample is balanced in most cases, some differences remain for the first set of variables with nearest neighbors and mahalanobis weights for the study of credit constraints at the extensive margin and also with the

mahalanobis weights with the second set of variables, whatever the outcome. A bad balancing prevents from interpreting the estimates because it means that differences in observables remain after the reweighting.

6.2 On declarative credit constraints : constraints at the extensive margin

Table 4.7 shows that the probability of being constrained (strict or broad definition) at the extensive margin decreases with annual income. The point estimate is larger for the definition including discouraged borrowers, meaning that income is a key criterion of self selection. Educated couples are less constrained : having a diploma decreases the probability of being constrained, and the female's education has a larger impact than male's education, for both definition of credit constraints. The point estimate of female's education is larger for credit constrained including discouraged borrowers, whereas the point estimate of the male's education is similar. It means that female's education could alter the decision to apply for a credit. Children and male's age do not impact credit constraints, but female's age do, especially for the measure including discourage borrowers. Having savings increases the probability of being constrained, when the discouraged borrowers are included.

Table 4.7 also shows that married couples have higher income, the male is more educated, but married female are less educated than their unmarried counterparts. They are older than unmarried couples. Therefore, the direction of the bias is not clear : married couples tend to share characteristics increasing credit constrained (female less educated and older) but also characteristics decreasing credit constraints (more income and more educated males).

Table 4.14 gives the results for the impact of being married using the strict definition. The simple difference indicates that among married couples there are 1.4% (in

% points) less constrained couples than among unmarried couples, but the difference is not significant : on the subsample of couples on the common support, unmarried couples do not seem to be turned down more often than married couples. However, the sign of the coefficient is negative, meaning that married couples experience slightly less credit constraints than unmarried couples. Introducing controls does not alter this result. Matching and weighting estimators tend to decrease the point estimate, but the difference is not significant neither, both for the ATT and the ATU. The estimator based on the Mahalanobis metric gives a lower point estimate for the ATU than other estimators. The Mahalanobis metric tends to weight more couples that are unlikely to get married according to the propensity score. If those couples are unconstrained unmarried couples then it tends to decrease the difference between the two groups. The HIR weights give significant credit constraints with the second set of variables, indicating that being married decreases the risk of credit constraint by 1.7% (instead of 1.3% for simple difference). The HIR weights are very close (in that case) to the kernel weights but the kernel estimator does not give significant results. The HIR weights give more weights to unmarried couples having a high propensity score than the kernel estimator : the difference in the point estimate could be explained by strong credit constraints for unmarried couples very similar to married couples. According to the nearest neighbors estimators, unmarried couples would experience 2.8% points less credit constraints were they married (with the first set of covariates), but other estimators do not support this result. Taken together, the estimators tend to conclude that if any, the impact of marriage on the probability of being turned down is very low in percentage point. But a back of the envelop calculation indicates that the impact is quite big : notice that 4.0% of married couples are credit constraints (at the extensive margin, strict definition). The HIR estimation indicates that if the impact of marriage for married couples on credit constraints reduces 1.7 percentage points the number of credit constraints household. So it corresponds to a decrease of 29.8% of credit

constraints households among the married couples (1.7/(4+1.7)). Similarly, there are 5.2% of credit constraints households (strict definition) among the unmarried. The nearest neighbors estimators indicate that being married would decrease with 2.8 percentage points the probability of being constrained if married. So if all of got married, it would decrease the probability of constrained household among this population with 53.4% (2.8/5.2). The sign of the estimate is robust and remains negative for almost all estimators. The comparison between matching estimators shows that unmarried couples similar to married couples are more likely to be constrained.

Table 4.15 gives the results of the impact of marriage on credit constraints, including discouraged borrowers. The simple difference is negative and significant. It indicates that there are 2.2% (% points) more credit constrained household among unmarried couples than among married couples : unmarried couples seem more credit constrained than married couples. The matching estimators give larger (but not significant) point estimates than the simple difference. Because of a lower variance, the HIR weighing estimators give significant results : if they were not married, married couples would have experience an increase in their credit constraints from 2.4% to 3.0%, in % points (including controls). The HIR estimation of the ATU, however, is not significant : unmarried couples would not experience lower credit constraints if they were married. The nearest neighbors and the mahalanobis estimators indicate that unmarried couples would also experience significantly lower credit constraints if they were married. Higher point estimates mean that married couples have observable characteristics that would affect them if they were not married, such characteristics could be a less educated female. Notice that 7% of married couples are constrained at the extensive margin according to the broad definition, and 9% of unmarried couples. As a consequence, according to the HIR weights, being married decreases the number of constrained household with 26.3% (2.5/(2.5+7)).

The difference between the strict definition of credit constraints and broad definition is the inclusion of discouraged borrowers. Of course, the ignorability assumption is likely to be violated in the case of discouraged borrowers. There might be some unobserved factors, such as the decision to form a household that are positively correlated to the intention to apply (so negatively to credit constraint) for a credit and marriage. This would bias downward the impact of marriage on credit constraints, and so increase the difference between married and unmarried. So, the difference between the results for the two definitions shows that married couples tend to be less discouraged, maybe because of the dynamic of the formation of the household. As the bank does not discriminate on the marital status, the results do not support the signalling assumption of marriage.

6.3 On the measure of credit constraints at the intensive margin

First of all, notice that approved couples for a loan do not necessarily contract a loan. Among approved couples, only 56% have indeed contracted a loan (1242 over 2231). It means that there is a selection, between approved couples, of who access to ownership. To study this selection, it would be interesting to observe the terms of the loan couples were approved for. As shows in fig. 4.2, the selection of approved couples is more important among unmarried couples than among married couples : 64% of married couples approved for a loan eventually contract a loan whereas only 40% of them eventually do.

On the subsample of credit constraints households (defined as in section 4.2.2), the impact of covariates on credit outcomes are presented in table 4.8 for the first set of covariates and table 4.9 for the second set of covariates. Controlled for the characteristics of the loan, the value of the debt does not seem to be correlated with

other household covariates (column (1) and (2)). The total cost of the debt[11] is correlated to the characteristics of the loan, but also to the employment status of the woman : working part time is positively correlated to the cost of the loan and having two or more children is negatively correlated to the cost (column (3)). The downpayment is positively correlated to the education of the partners, and the female's age (column (4)). This could be explained by assets accumulation over the life cycle. The percentage of downpayment is mostly correlated to the characteristics of the debt, and positively to the employment status of the woman (column (6)). A higher income is correlated with a higher debt, higher downpayment and lower cost. But it is also negatively correlated to part time activity, education and children (column (7)).

Married couples tend to be a bit different than unmarried couples : the woman is older, they have more children and the female is often less educated than unmarried counterparts. Their loan is similar to the loan of unmarried couples. The differences between married and unmarried couples justify using matching methods because they are likely to be correlated to credit constrants.

Table 4.16 shows that married couples tend to borrow 5248 euros (with set 1) less than unmarried couples, although the difference is slightly significant. The sign is robust to all estimators. The controlled OLS and the Oaxaca Blinder decomposition reinforce the impact of marriage (the controlled OLS regression give significant results for both set of covariates), while matching estimator do not give clear results. HIR weights confirm the simple difference estimation, indicating that married couples borrow less than unmarried couples (6840 euros for the set 1, 9895 for the set 2). This result is surprising because it does not support the main idea of the signalling theory.

However, this crude definition of the value of the debt might not be adapted : even if the income is controlled for, the relationship between income and debt could

11. If the household borrows M and refunds $(1+c)M$, the total cost of the loan is c.

be different than linear. Instead, I consider measuring the debt in terms of annual income. Table 4.17 shows that married households are significantly less indebted than unmarried couples, and decrease their debt by 0.17 annual income. While the controlled OLS coefficient tends to support this result, the estimation based on matching and reweighting estimators tend to lower the point estimate for the ATT, which become not significant and to increase the coefficient for the ATU that remains significant. As a consequence, married couples would not lower the amount borrowed if they were not married, but unmarried couples would have a lower debt.

Married couples tend to have a lower downpayment than unmarried couples, although the simple difference is slightly significant, but there is no difference between couples in the downpayment expressed as a proportion of the value of the housing (tables 4.18 and 4.19). This is easily explained by the differences in the value of the debt. Matching and reweighted estimators tend to show that married couple would have even lower downpayment, have they not been married (than what indicates the simple difference) and unmarried couples would have decrease, although not significantly the value of their downpayment. The matching and reweighting estimators control for the value of the debt. Therefore, the differences in the value of the downpayment could be interpret as the reward of being married. The ATT tends to be significant with the HIR weights, meaning that married couples should bring more downpayment, would they be unmarried, but the ATU is not significant : unmarried couples would not benefit from such a reward. This difference could be explained by the female's employment status, which is the main difference in the observables between married and unmarried couples. The ATT is computed by reweighting the unmarried : therefore the significant difference means that the marital status could have an impact *per se* on the demanded downpayment when the woman is inactive. The ATU is computed by reweighting the married couples : when the woman is working full time, the marital status does not impact the value of the downpayment. The proportion of downpayment is not affected

by the marital status (table 4.19). The simple difference in table 4.21 confirms that married couples are slightly wealthier than unmarried couples. Reweighting for demographic and debt characteristics does not reverse the sign of the coefficient : married households require the same income to borrow a fixed debt, keeping the downpayment and the cost of the loan constant.

Surprisingly, the table 4.20 points out a higher cost of credit for married couples. While the simple difference is not significant, controlled OLS and matching and reweighting estimator using the second set of variables give significant and even higher point estimates for the impact of marriage on the cost of credit. The first set of variables gives qualitatively similar results, but not significant (althought it stays close to be significant). Why is the cost higher for married couples ? The description of the loans contracted by couples in table 4.4 shows that married couples contract lower debt and they contract less often a zero rate loan (prêt à taux zéro, PTZ). I have tested this assumption computing the cost of the loan without taking into account PTZ loans (results not showed here) and the total cost remains higher for married couples. The mean duration is similar for married (15.39) than unmarried couples (15.45) and the mean interest rates offered are very close, and a bit higher for unmarried (3.66% for married and 3.69% for unmarried). Therefore, the difference in the total cost must be explained by a different structure of the debt.

As a consequence, the overall results given by the analysis are quite surprising. Married couples do not seem to be advantaged on the credit market, if not disadvantaged : the cost of the loan is higher and they are approved for lower debts. These surprising results can be related to the self selection process highlighted above. Among unmarried, the discouraged borrowers could be those having the worst credit proposals, while married couples having the same proposals, are not discouraged because of some omitting factors, such as the willingness to form a household. The self selection

is reinforced by the selection in the contract, because all approved borrowers did not eventually contract a loan. Therefore, even if the ignorability assumption is likely to hold when considering the credit supply, it is not likely to hold considering that what is observed is also conditional on couples agreeing on the conditions of the bank. So, high costs could have discouraged more elastic couples : unmarried couples are likely to be more elastic to the cost of the loan because of different unobservable characteristics.

7 Conclusion

This paper investigates the link between marriage and credit constraints, using the French housing survey in 2001. The leading idea is that marriage could be used as a signal toward the bank of the quality of the match. I estimate the impact of marriage on credit constraints using matching estimators to match married couples to unmarried couples. I propose different matching estimators. The comparison of matching estimators is interesting as a robustness check : for all outcomes, some estimators give significant results and some do not. This comparison highlights the sensitivity of the estimators to the choice of the set of covariates and to the weights attributed by the matching process. The HIR weights are taken as the most relevant as they give more efficient estimators.

The results tend to support the idea that married couples are less credit constrained at the extensive margin, when discouraged borrowers are included, but not when they are excluded. Therefore, it is difficult to interpret this result as the direct impact of marriage. It mostly supports the idea of selection in the marriage, that appeals couples willing to form a household. On the contrary, the results show the married couples are worst off on the credit market. This should not be seen as a negative impact of marriage but as the consequence of selection in the marriage. Married couples are more likely to accept less advantageous credits than unmarried couples. Therefore,

the marriage is indeed correlated to outcomes on the credit market, although the hypothesis of marriage as signal is not verified. These results are interesting in a long run perspective. The number of cohabitant couples is increasing in France, because of the increase in cohabitation before marriage and of cohabitation as a permanent state. This evolution could have dilute the value of marriage as a signal. Therefore, it could be interesting to complete this study including older and more recent waves of the survey, in order to study the evolution of credit constraints. Moreover, it could be interested to investigate if other characteristics could be used as signal of the stability of the couple, such as children or labor supply of female. I leave the task of extending the study to incorporate evolution for future research.

8 Annexes

8.1 Financial difficulties

TABLE 4.1: Households experiencing financial difficulties, by matrimonial status

	Experienced Financial difficulties :			
	Never	Less than 1 y. ago	During the last years	Total
Single, never separated	74.4	12.2	13.3	100.0
Couple, not separated	76.5	8.4	15.1	100.0
Unmarried	*69.1*	*16.3*	*14.6*	*100.0*
Married	*78.2*	*7.0*	*14.8*	*100.0*
Separation <1 y. ago	51.8	31.8	16.4	100.0
Previously unmarried	*56.1*	*30.6*	*13.3*	*100.0*
Previously married	*48.3*	*36.0*	*15.7*	*100.0*
Separation]1,5] y. ago	55.1	15.1	29.7	100.0
Previously unmarried	*55.0*	*17.8*	*27.1*	*100.0*
Previously married	*55.5*	*13.6*	*30.9*	*100.0*
Total	73.1	10.2	16.8	100.0

Source : Assets survey 1998 *Enquête Patrimoine 1998* - The subsample excludes household with at least one self employed spouse.
Lecture : 56.1% of individuals that broke up from an unmarried couple less than one year ago never experienced financial difficulties.

TABLE 4.2: Main declared reason of financial difficulty

	Main declared reason of financial difficulty				
	Professional (e.g. unemployment)	Personnal (incl. separation)	Current expenses	Refund	Total Total
Single, never separated	39.9	11.5	42.7	5.9	100.0
Couple, not separated	45.0	8.2	40.5	6.3	100.0
Unmarried	*53.3*	*7.5*	*37.2*	*2.0*	*100.0*
Married	*42.7*	*7.6*	*42.6*	*7.2*	*100.0*
Separation <1 y. ago	28.3	50.9	20.8	0.0	100.0
Previously unmarried	*27.9*	*30.2*	*41.9*	*0.0*	*100.0*
Previously married	*37.0*	*58.7*	*4.3*	*0.0*	*100.0*
Separation]1,5] y. ago	40.8	29.3	28.0	1.9	100.0
Previously unmarried	*50.0*	*19.0*	*27.6*	*3.4*	*100.0*
Previously married	*37.6*	*32.9*	*28.2*	*1.2*	*100.0*
Separation >5 y. ago	37.9	21.4	38.3	2.4	100.0
Previously unmarried	*52.8*	*11.1*	*33.3*	*2.8*	*100.0*
Previously married	*33.5*	*23.9*	*40.0*	*2.6*	*100.0*
Total	42.2	14.3	38.4	5.1	100.0

Source : Assets survey 1998 *Enquête Patrimoine 1998* - The subsample excludes household with at least one self employed spouse.
Lecture : 27.9% of individuals that broke up from an unmarried couple less than one year ago declaring having experienced financial difficulties attribute them to professional issues.

8.2 Macro environnement and sub sample selection

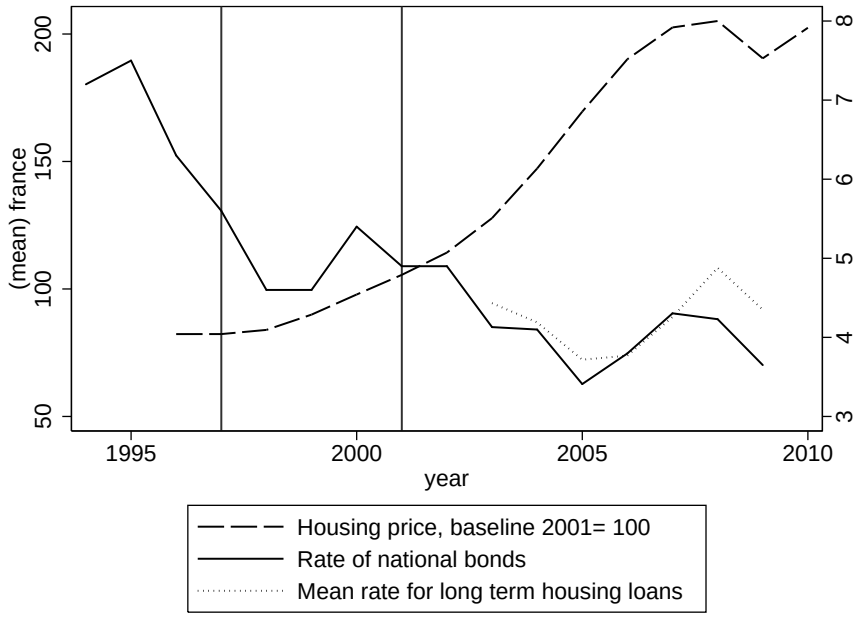


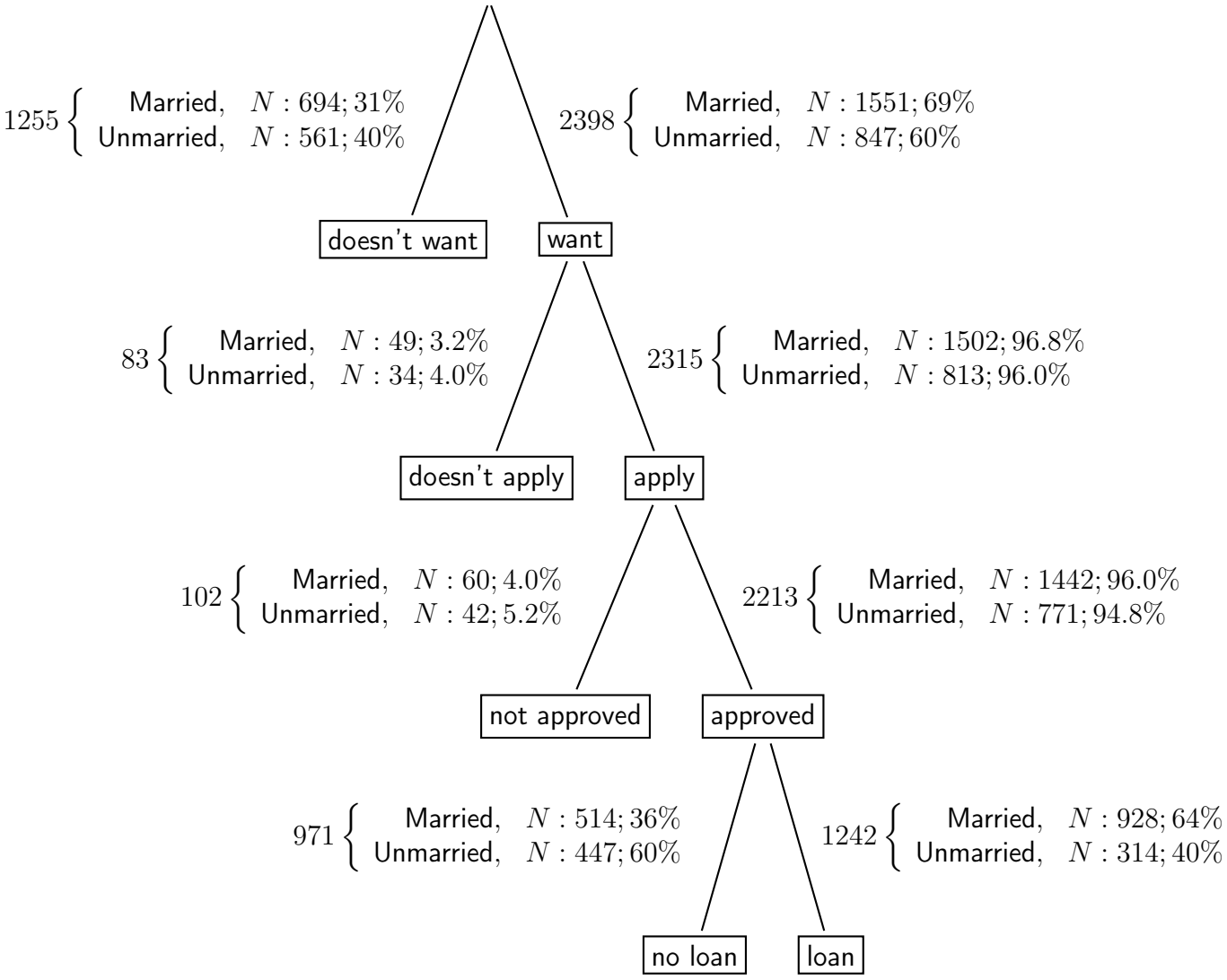
FIGURE 4.1: Macroeconomic variables

TABLE 4.3: Sub-sample selection

Selection	N (remaining)
Total sample	32,156
Keep couples	19,951
Was with another partner 5 years ago	19,776
Keep renters and recent owners	11,010
Drop owners having other goods	10,025
Drop self-employed	9,106
Drop if male does not full time	7,045
Drop if female inactive	5,353
Willingness to invest	2,410 (strict) 2,508 (broad)
Matching reasons	2,315 (strict) 2,398 (broad)

8.3 Application process

FIGURE 4.2: Getting a loan : process of application



Unconstrained household :	Want→Apply→Approved (2213 couples).
Strict definition of constrained household :	Want→Apply→Not Approved (102 couples).
Broad definition of constrained household :	Want→Doesn't apply + Want→Apply→Not Approved (102+83 couples)

8.4 Descriptive statistics

TABLE 4.4: Descriptive statistics - characteristics of indebted households, depending if they are credit constrained at the intensive margin

	Unconstrained			**Constrained**		
	Unmarried	Married	Total	Unmarried	Married	Total
Annual Income	38088	40028	39527	29633	30711	30459
Male age	32.88	35.8	35.05	32.47	34.62	34.11
Female age	31.4	34.07	33.38	30.63	32.93	32.39
Nb of kids	.72	1.42	1.24	.96	1.42	1.31
Female works part time	.2	.33	.3	.36	.42	.41
Male works in public sector	.2	.27	.25	.13	.21	.19
Female works in public sector	.29	.35	.33	.28	.28	.28
Male diploma						
No diploma	.09	.09	.09	.07	.08	.08
Up to High school	.52	.53	.52	.7	.66	.67
Some college	.4	.39	.39	.22	.25	.24
Female diploma						
No diploma	.05	.08	.07	.04	.09	.08
Up to High school	.42	.47	.46	.56	.63	.62
Some college	.53	.45	.47	.39	.27	.3
N	97	304	401	217	624	841

TABLE 4.5: Descriptive statistics, depending on constraint status at the extensive margin

	Unconstrained			**Constrained (strict)**			**Constrained (broad)**		
	Unmarried	Married	All	Unmarried	Married	All	Unmarried	Married	All
Annual Income	31924	35015	33938	24359	28035	26521	23306	27456	25751
Male age	31.23	35.16	33.79	31.64	35.28	33.78	31.41	35.89	34.05
Female age	29.66	33.45	32.13	29.83	32.7	31.52	29.92	33.92	32.28
Nb of kids	.63	1.39	1.13	.67	1.57	1.2	.79	1.59	1.26
Male works in public sector	.19	.24	.23	.17	.13	.15	.16	.16	.16
Female Activity									
works part time	.27	.38	.34	.38	.42	.4	.46	.46	.46
Unemployed	.08	.09	.09	.19	.18	.19	.25	.21	.23
Employed	.92	.91	.91	.81	.82	.81	.75	.79	.77
Female works in public sector	.29	.3	.3	.24	.25	.25	.25	.2	.22
Male diploma									
No diploma	.09	.11	.1	.36	.27	.3	.29	.23	.25
Up to High school	.62	.59	.6	.5	.58	.55	.57	.61	.59
Some college	.29	.3	.3	.14	.15	.15	.14	.16	.15
Female diploma									
No diploma	.06	.12	.09	.17	.35	.27	.18	.32	.26
Up to High school	.51	.52	.52	.69	.53	.6	.67	.5	.57
Some college	.43	.36	.39	.14	.12	.13	.14	.17	.16
N	771	1442	**2213**	42	60	**102**	76	109	**185**

TABLE 4.6: Descriptive statistics on credit

	Constrained			**Unconstrained**		
	Unmarried	Married	All	Unmarried	Married	All
Value (in years of income)	4.134	3.744	3.836	2.562	2.69	2.658
Total debt	98324	98186	98218	73416	78719	77357
Debt (by year of income)	3.466	3.246	3.298	1.986	2.017	2.009
Downpayment	23237	18312	19480	24856	25861	25603
% no downpayment	0.186	0.234	0.222	0.243	0.202	0.212
% of the value in downpayment	0.153	0.134	0.139	0.222	0.211	0.214
Downpayment (inc. PTZ)	33454	28671	29806	28209	30860	30179
% no downpayment (inc. PTZ)	0.062	0.109	0.098	0.173	0.15	0.156
% of the value in downpayment (inc. PTZ)	0.253	0.241	0.244	0.266	0.261	0.263
Cost	1.463	1.49	1.484	1.507	1.497	1.5
Effort rate	0.274	0.262	0.265	0.178	0.187	0.185
N	97	304	401	217	624	841

8.5 Impact of covariates on credit constraints and estimation of the propensity score

TABLE 4.7: Impact of covariates on credit constraints at the extensive margin - OLS regressions

	Credit Constrained (strict)		Credit Constrained (broad)		Married	
	(1)	(2)	(3)	(4)	(5)	(6)
Income : among 33-66%	-0.0332^a		-0.0667^a		0.0344	
	(0.0111)		(0.0140)		(0.0235)	
Income : among the top 33%	-0.0351^a		-0.0740^a		0.0823^a	
	(0.0129)		(0.0164)		(0.0275)	
Woman works part time	-0.0034	0.0003	0.0067	0.0126	0.0309	0.0263
	(0.0095)	(0.0094)	(0.0120)	(0.0119)	(0.0201)	(0.0198)
Male education : up to high school	-0.0577^a	-0.0597^a	-0.0543^a	-0.0573^a	0.0340	0.0427
	(0.0146)	(0.0146)	(0.0183)	(0.0184)	(0.0308)	(0.0307)
Male education : some college	-0.0497^a	-0.0512^a	-0.0458^b	-0.0449^b	0.0694^c	0.0838^b
	(0.0174)	(0.0175)	(0.0220)	(0.0222)	(0.0370)	(0.0370)
Female education : up to high school	-0.0488^a	-0.0519^a	-0.0753^a	-0.0796^a	-0.0676^b	-0.0496
	(0.0154)	(0.0154)	(0.0192)	(0.0193)	(0.0322)	(0.0322)
Female education : some college	-0.0744^a	-0.0777^a	-0.0987^a	-0.1011^a	-0.0978^a	-0.0685^c
	(0.0180)	(0.0180)	(0.0225)	(0.0226)	(0.0378)	(0.0378)
Has 1 child	-0.0108	-0.0129	-0.0005	-0.0032	0.1953^a	0.1970^a
	(0.0109)	(0.0108)	(0.0138)	(0.0137)	(0.0232)	(0.0230)
Has 2 children (or more)	-0.0027	-0.0036	0.0121	0.0132	0.3307^a	0.3334^a
	(0.0118)	(0.0117)	(0.0149)	(0.0148)	(0.0250)	(0.0246)
Male age : $\in [31, 35]$	0.0061		0.0181		0.0631^b	
	(0.0129)		(0.0163)		(0.0274)	
Male age : ≥ 36	0.0122		0.0281		0.0997^a	
	(0.0156)		(0.0197)		(0.0331)	
Female age : $\in [29, 33]$	-0.0180	-0.0179	-0.0366^b	-0.0332^b	0.0660^b	0.0557^b
	(0.0129)	(0.0121)	(0.0162)	(0.0154)	(0.0273)	(0.0257)
Female age : ≥ 34	-0.0334^b	-0.0294^c	-0.0494^b	-0.0374^c	0.0695^b	0.0214
	(0.0160)	(0.0158)	(0.0201)	(0.0200)	(0.0338)	(0.0334)
Man : Works in public sector	-0.0078	-0.0101	-0.0070	-0.0119	0.0585^b	0.0570^b
	(0.0106)	(0.0106)	(0.0135)	(0.0135)	(0.0227)	(0.0226)
Woman : Works in public sector	0.0113	0.0100	0.0069	0.0048	-0.0225	-0.0169
	(0.0099)	(0.0098)	(0.0126)	(0.0125)	(0.0211)	(0.0209)
Has savings	-0.0124	-0.0135	-0.0245^b	-0.0265^b	-0.0118	-0.0088
	(0.0088)	(0.0088)	(0.0111)	(0.0112)	(0.0187)	(0.0186)
Income		-0.0008^b		-0.0000^a		0.0000^c
		(0.0004)		(0.0000)		(0.0000)
Male's age		0.0002		0.0005		0.0117 ^{a}
		(0.0010)		(0.0013)		(0.0021)
Constant	0.1915^a	0.1973^a	0.2649^a	0.2828^a	0.3464^a	-0.0154
	(0.0192)	(0.0358)	(0.0240)	(0.0452)	(0.0403)	(0.0756)
Observations	2315	2315	2398	2398	2398	2398
R^2	0.040	0.038	0.056	0.052	0.170	0.175

Outcomes : (1) and (2)=1 if household constrained according to the strict definition
(3) and (4)= 1 if household constrained according to the board definition
(5) and (6)= 1 if married couple.
Standard errors in parentheses
^{c} p<0.1, ^{b} p<0.05, ^{a} p<0.01

TABLE 4.8: Impact of covariates on credit constraints at the intensive margin (set of discrete variables) - OLS regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Outcomes :			
	Debt (in 1000)	Debt (in an.inc.)	Total cost	Downp. (in 1000)	Downp. (in %)	Income (in 1000)	Married
Income : among 33-66%	13.3^a	-.465^a	-.0329	-3	-.0205		.0552
	(2.78)	(.0863)	(.025)	(3.47)	(.0184)		(.0577)
Income : among the top 33%	35.3^a	-.7^a	-.102^a	4.86	-.0443^c		.11
	(3.17)	(.0983)	(.0312)	(4.42)	(.0233)	(.0736)	
Downpayment :$\in [10\%, 30\%]$	4.3	.149	-.107^a	10^a		-.591	-.024
	(3.16)	(.0981)	(.0263)	(3.5)		(1.01)	(.0613)
Downpayment :$> 30\%$	-10.3^b	-.151	-.182^a	38.9^a		-2.97^b	-.042
	(4.34)	(.135)	(.0349)	(4.02)		(1.36)	(.0835)
Downpayment $\in]0, 16000[$	-5.88^b	-.291^a	-.00548		.0564^a	1.12	-.0142
	(2.99)	(.0928)	(.0254)		(.018)	(.945)	(.0578)
Downpayment ≥ 16000	9.91^a	-.0364	.0188		.212^a	4.94^a	-.0358
	(3.67)	(.114)	(.0312)		(.0185)	(1.16)	(.0711)
Total cost : among 33-66%	8.53^a	.14		-4.72	-.0621^a	-1.44	.0658
	(2.79)	(.0866)		(3.3)	(.0172)	(.881)	(.0545)
Total cost : among the top 33%	16.3^a	.438^a		-2.15	-.117^a	-3.04^a	.0962
	(2.95)	(.0915)		(3.61)	(.0182)	(.947)	(.0598)
Woman works part time	-1.56	.0547	.073^a	-1.47	.0251^c	-2.19^a	-.00839
	(2.44)	(.0758)	(.0204)	(2.84)	(.0149)	(.763)	(.047)
Man : Works in public sector	-4.08	-.108	.0486^c	-2.67	.0139	.609	.0889
	(3.05)	(.0946)	(.0256)	(3.54)	(.0187)	(.955)	(.0586)
Woman : Works in public sector	-2.16	.00434	-.0439^b	-.904	.000263	.12	-.0351
	(2.62)	(.0814)	(.0221)	(3.05)	(.0161)	(.827)	(.0504)
Male education : some college	4.73	-.109	-.0159	10.9^a	.00183	4.08^a	.0889
	(3)	(.0932)	(.0253)	(3.47)	(.0184)	(.938)	(.0578)
Female education : some college	3.13	.0185	.0514^b	9.03^a	-.00931	3.39^a	-.0823
	(2.9)	(.0901)	(.0244)	(3.36)	(.0177)	(.899)	(.0558)
Has 1 child	3.69	-.122	-.0276	-1.5	.00592	1.47	.141^b
	(3.15)	(.098)	(.0265)	(3.67)	(.0194)	(.996)	(.0607)
Has 2 children (or more)	5.7^c	-.14	-.0442^c	-2.24	.0294	2.2^b	.223^a
	(3.19)	(.099)	(.0266)	(3.69)	(.0195)	(1.01)	(.0613)
Male age : $\in [31, 35]$	-1.2	.054	.0416	-3.97	.011	.422	-.0144
	(3.24)	(.101)	(.0272)	(3.76)	(.0199)	(1.02)	(.0623)
Male age : ≥ 36	1.06	.122	-.0127	.779	.00674	.599	-.0434
	(3.74)	(.116)	(.0317)	(4.36)	(.023)	(1.18)	(.0722)
Female age : $\in [29, 33]$	-1.83	-.0436	-.00441	1.31	.00585	.579	.131^b
	(3.08)	(.0956)	(.026)	(3.57)	(.0189)	(.97)	(.0592)
Female age : ≥ 34	-3.02	-.105	.0418	7.58^c	.00046	1.31	.177^b
	(3.89)	(.121)	(.0329)	(4.47)	(.0238)	(1.23)	(.075)
Debt : among 33-66%			.071^a	1.27	.00722	4.53^a	-.0148
			(.0251)	(3.52)	(.0184)	(.881)	(.0585)
Debt : among the top 33%			.153^a	6.49	-.0186	10.6^a	-.109
			(.0301)	(4.32)	(.0227)	(.98)	(.0722)
Constant	70^a	3.72^a	1.53^a	-3.49	.187^a	21.7^a	.499^a
	(4.77)	(.148)	(.0359)	(5.31)	(.0269)	(1.5)	(.0926)
Observations	397	397	397	397	397	397	397
R^2	0.475	0.287	0.216	0.377	0.436	0.522	0.113

Standard errors in parentheses
^{c} p<0.1, ^{b} p<0.05, ^{a} p<0.01

TABLE 4.9: Impact of covariates on credit constraints at the intensive margin (set of continuous variables) - OLS regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Outcomes :			
	Debt (in 1000)	Debt (in an.inc.)	Total cost	Downp. (in 1000)	Downp. (in %)	Income (in 1000)	Married
Income	2.47^{a}	-.033^{a}	-7.6e-03^{a}	.881^{a}	-7.1e-05		9.3e-03^{b}
	(.113)	(4.5e-03)	(1.8e-03)	(.209)	(1.2e-03)		(4.1e-03)
% of downpayment	-25.9^{a}	-1.17^{a}	-.321^{a}	112^{a}		-.126	-.024
	(7.03)	(.281)	(.075)	(6.94)		(2.15)	(.175)
Downpayment	.03	4.5e-03^{a}	1.5e-04		3.6e-03^{a}	.051 ^{a}	-1.2e-03
	(.041)	(1.6e-03)	(4.3e-04)		(2.2e-04)	(.012)	(9.9e-04)
Total cost	24.9^{a}	.786^{a}		2.11	-.144^{a}	-6.05 ^{a}	.201^{c}
	(4.62)	(.185)		(6.02)	(.033)	(1.41)	(.117)
Woman works part time	.941	.022	.067^{a}	.396	.036^{a}	-1.6^{a}	-.014
	(1.9)	(.076)	(.02)	(2.39)	(.013)	(.567)	(.046)
Man : Works in public sector	-2.83	-.14	.062^{b}	-2.29	8.4e-03	1.37^{c}	.081
	(2.36)	(.095)	(.025)	(2.97)	(.017)	(.71)	(.058)
Woman : Works in public sector	-1.17	-.011	-.038^{c}	-.734	-3.2e-03	.409	-.031
	(2.04)	(.082)	(.022)	(2.57)	(.015)	(.616)	(.05)
Male education : some college	-2.32	-.071	8.0e-03	3.87	-9.8e-04	2.91^{a}	.077
	(2.36)	(.095)	(.025)	(2.97)	(.017)	(.696)	(.058)
Female education : some college	-2.26	5.3e-03	.053^{b}	8.18^{a}	-.023	2.32^{a}	-.089
	(2.27)	(.091)	(.024)	(2.83)	(.016)	(.676)	(.056)
Has 1 child	-.587	-.094	-.013	-3.71	.03^{c}	1.4 ^{c}	.135^{b}
	(2.43)	(.097)	(.026)	(3.05)	(.017)	(.729)	(.059)
Has 2 children (or more)	.274	-.065	-.025	-7.38^{b}	.052^{a}	1.54^{b}	.221^{a}
	(2.42)	(.097)	(.026)	(3.02)	(.017)	(.725)	(.059)
Male's age	.049	4.7e-03	-2.4e-03	.339	-1.9e-03	-.016	2.0e-03
	(.254)	(.01)	(2.7e-03)	(.319)	(1.8e-03)	(.077)	(6.2e-03)
Female's age	-.197	-6.1e-03	3.7e-03	.087	4.5e-04	.137^{c}	5.8e-03
	(.245)	(9.8e-03)	(2.6e-03)	(.309)	(1.8e-03)	(.074)	(6.0e-03)
Debt			2.8e-03^{a}	.047	-1.3e-03^{a}	.224^{a}	-2.9e-03^{b}
			(5.3e-04)	(.064)	(3.6e-04)	(.01)	(1.2e-03)
Constant	-2.06	3.49^{a}	1.45^{a}	-55.2^{a}	.526^{a}	10.3^{a}	.096
	(9.77)	(.391)	(.073)	(12)	(.064)	(2.89)	(.239)
Observations	397	397	397	397	397	397	397
R^2	0.674	0.263	0.221	0.547	0.524	0.729	0.106

Standard errors in parentheses
^{c} p<0.1, ^{b} p<0.05, ^{a} p<0.01

TABLE 4.10: Estimation of the propensity score (extensive margin) $P(m_i = 1|X_i)$ Probit estimation

	(1)	(2)	(3)	(4)
Set of the outcome :	Constraint (strict)		Constraint (broad)	
Income : among 33-66%	.0884		.107	
	(.0745)		(.0728)	
Income : among the top 33%	.249^a		.257^a	
	(.0881)		(.0865)	
Woman works part time	.116^c	.102	.0995	.0838
	(.0655)	(.0648)	(.0642)	(.0635)
Male education : up to high school	.114	.142	.113	.139
	(.0999)	(.1)	(.0968)	(.0972)
Male education : some college	.24^b	.292^b	.228^c	.277^b
	(.12)	(.121)	(.117)	(.118)
Female education : up to high school	-.261^b	-.213^c	-.236^b	-.181^c
	(.111)	(.112)	(.107)	(.107)
Female education : some college	-.386^a	-.302^b	-.331^a	-.245^b
	(.128)	(.128)	(.123)	(.124)
Has 1 child	.531^a	.536^a	.514^a	.521^a
	(.0695)	(.0693)	(.0682)	(.068)
Has 2 children (or more)	1^a	1.01^a	.985^a	.992^a
	(.0801)	(.0795)	(.0782)	(.0777)
Male age : $\in [31, 35]$	.142^c		.157^c	
	(.0843)		(.0824)	
Male age : ≥ 36	.3^a		.287^a	
	(.104)		(.102)	
Female age : $\in [29, 33]$	.158^c	.102	.164^b	.113
	(.0835)	(.0798)	(.0815)	(.0781)
Female age : ≥ 34	.153	-.00447	.191^c	.027
	(.106)	(.106)	(.103)	(.104)
Man : Works in public sector	.187^b	.181^b	.19^a	.186^b
	(.0738)	(.0739)	(.0726)	(.0727)
Woman : Works in public sector	-.0558	-.0438	-.0768	-.0632
	(.0672)	(.067)	(.0662)	(.0661)
Has savings	-.0345	-.028	-.0319	-.024
	(.0596)	(.0597)	(.0586)	(.0587)
Income		.00413		4.56e-06^c
		(.00265)		(2.61e-06)
Male's age		.0371^a		.0369^a
		(.00698)		(.00683)
Constant	-.356^a	-1.5^a	-.399^a	-1.54^a
	(.135)	(.25)	(.13)	(.244)
Observations	2315	2315	2398	2398

Standard errors in parentheses
^{c} p<0.1, ^{b} p<0.05, ^{a} p<0.01
For all estimation, the outcome is $m_i = 1$ if the couple is married.
Column (1) and (2) : estimation of the propensity score for the population excluding discouraged borrowers
Column (3) and (4) : estimation of the propensity score for the population including discouraged borrowers

TABLE 4.11: Estimation of the propensity score (intensive margin - Set 1) Probit estimation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Outcomes :			
	Debt (in 1000)	Debt (in an.inc.)	Total cost	Downp. (in 1000)	Downp. (in %)	Income (in 1000)	All
Income : among 33-66%	.144	.144	.137	.18	.186		.189
	(.189)	(.189)	(.201)	(.203)	(.205)		(.205)
Income : among the top 33%	.144	.144	.257	.349	.375		.366
	(.212)	(.212)	(.252)	(.258)	(.259)		(.26)
Downpayment :$\in [10\%, 30\%]$	-.133	-.133	-.181	-.156		-.128	-.119
	(.22)	(.22)	(.216)	(.211)		(.221)	(.222)
Downpayment :$> 30\%$	-.126	-.126	-.296	-.243		-.184	-.155
	(.296)	(.296)	(.283)	(.24)		(.293)	(.296)
Downpayment $\in]0, 16000[$	-.0337	-.0337	-.0433		-.0827	-.0398	-.0647
	(.205)	(.205)	(.208)		(.205)	(.207)	(.208)
Downpayment ≥ 16000	-.183	-.183	-.13		-.203	-.0936	-.138
	(.247)	(.247)	(.25)		(.209)	(.247)	(.25)
Total cost : among 33-66%	.164	.164		.213	.221	.171	.213
	(.186)	(.186)		(.189)	(.186)	(.186)	(.189)
Total cost : among the top 33%	.251	.251		.357^c	.389^c	.285	.359^c
	(.198)	(.198)		(.212)	(.203)	(.205)	(.212)
Woman works part time	-.0296	-.0296	-.0204	-.0374	-.0477	-.0678	-.0374
	(.167)	(.167)	(.165)	(.167)	(.166)	(.166)	(.167)
Man : Works in public sector	.36	.36	.39^c	.372^c	.361	.398^c	.365
	(.222)	(.222)	(.221)	(.223)	(.223)	(.221)	(.223)
Woman : Works in public sector	-.144	-.144	-.169	-.149	-.147	-.142	-.151
	(.176)	(.176)	(.177)	(.177)	(.176)	(.176)	(.177)
Male education : some college	.286	.286	.272	.289	.315	.336^c	.304
	(.205)	(.205)	(.203)	(.204)	(.204)	(.203)	(.206)
Female education : some college	-.29	-.29	-.249	-.287	-.274	-.232	-.278
	(.191)	(.191)	(.19)	(.191)	(.191)	(.187)	(.192)
Has 1 child	.424^b	.424^b	.401^b	.443^b	.431^b	.446^b	.44^b
	(.201)	(.201)	(.2)	(.202)	(.202)	(.202)	(.202)
Has 2 children (or more)	.733^a	.733^a	.715^a	.756^a	.734^a	.752^a	.747^a
	(.211)	(.211)	(.209)	(.211)	(.21)	(.212)	(.212)
Male age : $\in [31, 35]$	-.0562	-.0562	-.0399	-.0525	-.0504	-.0205	-.0505
	(.211)	(.211)	(.211)	(.211)	(.211)	(.211)	(.212)
Male age : ≥ 36	-.192	-.192	-.166	-.155	-.156	-.142	-.157
	(.252)	(.252)	(.254)	(.254)	(.253)	(.253)	(.254)
Female age : $\in [29, 33]$	.4^b	.4^b	.384^c	.393^b	.397^b	.407^b	.395^b
	(.196)	(.196)	(.196)	(.196)	(.196)	(.196)	(.197)
Female age : ≥ 34	.612^b	.612^b	.602^b	.572^b	.596^b	.612^b	.587^b
	(.261)	(.261)	(.262)	(.259)	(.262)	(.262)	(.263)
Debt : among 33-66%			.0286	-.0309	-.0521	.064	-.0421
			(.203)	(.205)	(.205)	(.19)	(.208)
Debt : among the top 33%			-.237	-.392	-.391	-.179	-.387
			(.242)	(.252)	(.254)	(.21)	(.258)
Constant	-.0109	-.0109	.218	-.0502	-.109	.0237	-.0286
	(.316)	(.316)	(.285)	(.3)	(.289)	(.317)	(.321)
Observations	397	397	397	397	397	397	397
R^2							

Standard errors in parentheses - ^{c} p<0.1, ^{b} p<0.05, ^{a} p<0.01

Lecture : as the set of covariates is different for each outcome, there are as many estimations of the propensity score as final outcomes. But of course, as it is an estimation of the propensity score, the dependant variable is $m_i = 1$ if the couple is married. Column (1) gives the estimation of the propensity score when the set of covariate corresponds to the study of the final outcome : the value of the debt. The last column includes all covariates.

TABLE 4.12: Estimation of the propensity score (intensive margin - Set 2) Probit estimation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Outcomes :			
	Debt (in 1000)	Debt (in an.inc.)	Total cost	Downp. (in 1000)	Downp. (in %)	Income (in 1000)	All
Income	6.3e-03	6.3e-03	.023^{c}	.027^{b}	.032^{b}		.032^{b}
	(9.5e-03)	(9.5e-03)	(.014)	(.014)	(.015)		(.015)
% of downpayment	.209	.209	-.377	-.501		-.095	-.013
	(.654)	(.654)	(.608)	(.485)		(.632)	(.662)
Downpayment	-4.1e-03	-4.1e-03	-3.4e-03		-3.8e-03	-2.1e-03	-3.8e-03
	(3.3e-03)	(3.3e-03)	(3.1e-03)		(2.4e-03)	(3.1e-03)	(3.2e-03)
Total cost	.637	.637		1.01^{c}	1.05^{b}	.728	1.05^{b}
	(.464)	(.464)		(.515)	(.5)	(.479)	(.521)
Woman works part time	-.076	-.076	-.013	-.07	-.071	-.117	-.071
	(.166)	(.166)	(.163)	(.166)	(.165)	(.165)	(.166)
Man : Works in public sector	.351	.351	.372^{c}	.342	.331	.362^{c}	.331
	(.219)	(.219)	(.218)	(.22)	(.221)	(.218)	(.221)
Woman : Works in public sector	-.114	-.114	-.163	-.127	-.128	-.119	-.128
	(.174)	(.174)	(.175)	(.176)	(.176)	(.174)	(.176)
Male education : some college	.298	.298	.262	.26	.279	.36^{c}	.279
	(.204)	(.204)	(.203)	(.203)	(.205)	(.201)	(.205)
Female education : some college	-.277	-.277	-.247	-.32^{c}	-.293	-.225	-.293
	(.19)	(.19)	(.188)	(.189)	(.19)	(.187)	(.19)
Has 1 child	.413^{b}	.413^{b}	.395^{b}	.433^{b}	.414^{b}	.453^{b}	.415^{b}
	(.197)	(.197)	(.196)	(.197)	(.196)	(.196)	(.198)
Has 2 children (or more)	.735^{a}	.735^{a}	.717^{a}	.793^{a}	.762^{a}	.791^{a}	.763^{a}
	(.205)	(.205)	(.205)	(.206)	(.205)	(.206)	(.207)
Male's age	9.4e-03	9.4e-03	8.6e-03	.01	.011	9.8e-03	.011
	(.022)	(.022)	(.022)	(.022)	(.022)	(.022)	(.022)
Female's age	.017	.017	.017	.014	.015	.02	.015
	(.021)	(.021)	(.021)	(.021)	(.021)	(.021)	(.021)
Debt			-7.2e-03^{c}	-.011^{b}	-.01^{b}	-3.0e-03	-.01^{b}
			(4.1e-03)	(4.4e-03)	(4.4e-03)	(2.9e-03)	(4.5e-03)
Constant	-1.67^{c}	-1.67^{c}	-.375	-1.66^{c}	-1.95^{b}	-1.44	-1.94^{b}
	(.932)	(.932)	(.573)	(.938)	(.886)	(.915)	(.979)
Observations	397	397	397	397	397	397	397
R^2							

Standard errors in parentheses
^{c} p<0.1, ^{b} p<0.05, ^{a} p<0.01
Lecture : as the set of covariates is different for each outcome, there are as many estimations of the propensity score as final outcomes. But of course, as it is an estimation of the propensity score, the dependant variable is $m_i = 1$ if the couple is married. Column (1) gives the estimation of the propensity score when the set of covariate corresponds to the study of the final outcome : the value of the debt. The last column includes all covariates.

TABLE 4.13: P-value of χ^2 test for balancing of covariates

Outcome	NN weights				Kernel weights				Mahalanobis weights				HIR weights			
	Set 1		Set 2		Set 1		Set 2		Set 1		Set 2		Set 1		Set 2	
	ATT	ATU	ATT	ATU	ATT	ATU	ATT	ATU	ATT	ATU	ATT	ATU	ATT	ATU	ATT	ATU
CC - strict def.	.17	.12	.89	.68	.38	.99	.19	.89	0	.93	0.01	.57	1	.9	1	.8
CC - broad def.	.19	.61	.95	.85	.43	.98	.27	.92	0	.29	0	.61	1	.94	1	.86
Debt	.91	1	.79	1	.98	1	.97	1	.15	.43	0.01	.98	1	1	1	.92
Downpayment	.94	1	.33	1	.99	1	.79	1	.7	.71	0.01	.99	1	1	1	.85
Income	.37	1	.5	1	1	1	.88	1	.63	.83	0.01	.93	1	1	1	.88
% of downp.	.9	1	.43	1	.99	1	.88	1	.64	.82	0.02	.87	1	1	1	.86
Total cost	.36	1	.04	1	.99	1	.98	1	.27	.74	0.04	1	1	1	1	.96
Debt (in annual inc.)	.91	1	.79	1	.98	1	.97	1	.15	.43	0.01	.98	1	1	1	.92

Set 1 : Discrete variables ; Set 2 : Continuous variables
Each cell gives the P-value of a χ^2 test of overall balancing test.
Each row gives the tests for the matching procedure studying each outcome (the set of covariates is different for each outcome).
Lecture : the P-value of the χ^2 test of overall equality of covariates between the two population is 0.01 for the propensity score computed to study credit constraints (strict definition) reweighting unmarried to make them similar to married couples (ATT) using nearest neighbors weights.

8.6 Results

TABLE 4.14: Impact of marriage on credit constraints at the extensive margin - strict definition

	Credit constraints : strict definition			
	ATT		ATU	
Simple difference	-0.014 (0.009)	-0.013 (0.009)	-0.014 (0.009)	-0.013 (0.009)
OLS (with controls)	-0.009 (0.01)	-0.01 (0.01)	-0.009 (0.01)	-0.01 (0.01)
Oaxaca Blinder	-0.012 (0.012)	-0.013 (0.012)	-0.009 (0.01)	-0.008 (0.01)
Matching estimators				
Kernel (ana)	-0.011 (0.012)	-0.006 (0.012)	-0.007 (0.01)	-0.009 (0.011)
Kernel (bs)	-0.011 (0.011)	-0.006 (0.011)	-0.007 (0.012)	-0.009 (0.011)
Mahalanobis (ana)	-0.005 (0.015)	-0.005 (0.014)	-0.027 (0.018)	-0.023 (0.012) *
Nearest Neighbors (ana)	-0.003 (0.015)	-0.005 (0.013)	-0.006 (0.013)	-0.013 (0.012)
HIR weights estimators				
Simple difference	-0.01 (0.009)	-0.016 (0.009) *	-0.015 (0.012)	-0.014 (0.012)
WLS (with controls)	-0.012 (0.008)	-0.017 (0.009) *	-0.009 (0.015)	-0.008 (0.015)
Covariates	Discrete	Continuous	Discrete	Continuous
N	2259	2240	2259	2240

Standard errors into parenthesis. Ana means that the analytical variance is computed, bs means that the variance is estimated by bootstrap. Bootstrap variances : 250 replicates. Covariates include : male age, female age, annual income, number of kids, female education, male education, employment status of the female,

TABLE 4.15: Impact of marriage on credit constraints at the extensive margin - broad definition

	Credit constraints : strict definition			
	ATT		ATU	
Simple difference	-0.022 (0.011) *	-0.02 (0.012) *	-0.022 (0.011) *	-0.02 (0.012) *
OLS (with controls)	-0.021 (0.012) *	-0.021 (0.012) *	-0.021 (0.012) *	-0.021 (0.012) *
Oaxaca Blinder	-0.03 (0.014) **	-0.029 (0.015) **	-0.018 (0.013)	-0.017 (0.013)
Matching estimators				
Kernel (ana)	-0.022 (0.015)	-0.023 (0.015)	-0.015 (0.013)	-0.016 (0.013)
Kernel (bs)	-0.022 (0.014)	-0.023 (0.015)	-0.015 (0.014)	-0.016 (0.015)
Mahalanobis (ana)	-0.016 (0.022)	-0.024 (0.018)	-0.031 (0.02)	-0.043 (0.017) **
Nearest Neighbors (ana)	-0.015 (0.015)	-0.024 (0.017)	-0.01 (0.016)	-0.02 (0.015)
HIR weights estimators				
Simple difference	-0.024 (0.011) **	-0.027 (0.011) **	-0.021 (0.015)	-0.014 (0.016)
WLS (with controls)	-0.028 (0.011) **	-0.03 (0.011) ***	-0.022 (0.019)	-0.027 (0.02)
Covariates	Discrete	Continuous	Discrete	Continuous
N	2348	2321	2348	2321

Standard errors into parenthesis. Ana means that the analytical variance is computed, bs means that the variance is estimated by bootstrap. Bootstrap variances : 250 replicates. Covariates include : male age, female age, annual income, number of kids, female education, male education, employment status of the female,

TABLE 4.16: Impact of marriage on credit constraints at the intensive margin : debt

	Debt			
	ATT		ATU	
Simple difference	-5248 (3761)	-2655 (3615)	-5248 (3761)	-2655 (3615)
OLS (with controls)	-5241 (2748) *	-5513 (2013) ***	-5241 (2748) *	-5513 (2013) ***
Oaxaca Blinder	-1971 (3419)	-4116 (2725)	-5860 (3517) *	-5757 (2502) **
Matching estimators				
Kernel (ana)	-7122 (4597)	-5863 (4465)	-6375 (4468)	-3774 (4220)
Kernel (bs)	-7122 (4117) *	-5863 (3837)	-6375 (4353)	-3774 (4374)
Mahalanobis (ana)	-3447 (5440)	987 (5335)	-5543 (5770)	-529 (4887)
Nearest Neighbors (ana)	-8286 (0.015)	-6761 (5726)	-7564 (4881)	-5939 (4255)
HIR weights estimators				
Simple difference	-6840 (3326) **	-9895 (3637) ***	-3373 (6775)	-90 (6784)
WLS (with controls)	-2422 (2334)	-4891 (1559) ***	-5216 (5142)	-5474 (3678)
Covariates	Discrete	Continuous	Discrete	Continuous
N	360	366	360	366

Standard errors into parenthesis. Ana means that the analytical variance is computed, bs means that the variance is estimated by bootstrap. Bootstrap variances : 250 replicates. Covariates include : male age, female age, annual income, number of kids, female education, male education, employment status of the female, total cost, value of the downpayment, % of downpayment

TABLE 4.17: Impact of marriage on credit constraints at the intensive margin : value of debt in annual income

	Value of the debt expressed in annual income			
	ATT		ATU	
Simple difference	-0.163 (0.088) *	-0.174 (0.088) **	-0.163 (0.088) *	-0.174 (0.088) **
OLS (with controls)	-0.182 (0.078) **	-0.189 (0.076) **	-0.182 (0.078) **	-0.189 (0.076) **
Oaxaca Blinder	-0.053 (0.115)	-0.142 (0.115)	-0.213 (0.113) *	-0.196 (0.104) *
Matching estimators				
Kernel (ana)	-0.095 (0.105)	-0.133 (0.117)	-0.134 (0.106)	-0.195 (0.111) *
Kernel (bs)	-0.095 (0.089)	-0.133 (0.09)	-0.134 (0.118)	-0.195 (0.114) *
Mahalanobis (ana)	-0.009 (0.122)	0.014 (0.108)	-0.097 (0.128)	-0.229 (0.125) *
Nearest Neighbors (ana)	-0.078 (0.015)	-0.201 (0.104) *	-0.172 (0.113)	-0.188 (0.12)
HIR weights estimators				
Simple difference	-0.027 (0.068)	-0.125 (0.071) *	-0.127 (0.149)	-0.148 (0.143)
WLS (with controls)	-0.08 (0.057)	-0.177 (0.06) ***	-0.183 (0.127)	-0.194 (0.128)
Covariates	Discrete	Continuous	Discrete	Continuous
N	360	366	360	366

Standard errors into parenthesis. Ana means that the analytical variance is computed, bs means that the variance is estimated by bootstrap. Bootstrap variances : 250 replicates. Covariates include : male age, female age, annual income, number of kids, female education, male education, employment status of the female, total cost, value of the downpayment, % of downpayment

TABLE 4.18: Impact of marriage on credit constraints at the intensive margin : value of the downpayment

	Value of the downpayment			
	ATT		ATU	
Simple difference	-4107 (3559)	-4196 (3534)	-4107 (3559)	-4196 (3534)
OLS (with controls)	-4086 (2734)	-4473 (2418) *	-4086 (2734)	-4473 (2418) *
Oaxaca Blinder	-5044 (4588)	-3814 (3416)	-3658 (4373)	-3857 (3517)
Matching estimators				
Kernel (ana)	-5437 (5510)	-6645 (5277)	-4639 (5026)	-3891 (4960)
Kernel (bs)	-5437 (5428)	-6645 (4661)	-4639 (5471)	-3891 (5068)
Mahalanobis (ana)	-4221 (6617)	-254 (4363)	-456 (6602)	-7834 (5287)
Nearest Neighbors (ana)	-5332 (0.015)	-4952 (5238)	-4146 (5188)	-4857 (5070)
HIR weights estimators				
Simple difference	-7269 (3682) **	-9783 (4021) **	-5790 (5733)	-5642 (5510)
WLS (with controls)	-5188 (2503) **	-4910 (2352) **	-3521 (4187)	-4016 (3510)
Covariates	Discrete	Continuous	Discrete	Continuous
N	361	359	361	359

Standard errors into parenthesis. Ana means that the analytical variance is computed, bs means that the variance is estimated by bootstrap. Bootstrap variances : 250 replicates. Covariates include : male age, female age, annual income, number of kids, female education, male education, employment status of the female, total cost, value of the debt, % of downpayment

TABLE 4.19: Impact of marriage on credit constraints at the intensive margin : % of downpayment

	% of the downpayment			
	ATT		ATU	
Simple difference	-0.006 (0.019)	-0.009 (0.019)	-0.006 (0.019)	-0.009 (0.019)
OLS (with controls)	0.001 (0.013)	0.014 (0.009) *	0.001 (0.013)	0.014 (0.009) *
Oaxaca Blinder	0.001 (0.014)	0.003 (0.012)	0.002 (0.014)	0.019 (0.017)
Matching estimators				
Kernel (ana)	-0.002 (0.022)	0.006 (0.019)	-0.003 (0.02)	-0.003 (0.02)
Kernel (bs)	-0.002 (0.019)	0.006 (0.015)	-0.003 (0.02)	-0.003 (0.019)
Mahalanobis (ana)	-0.006 (0.025)	0.012 (0.025)	-0.014 (0.026)	-0.012 (0.025)
Nearest Neighbors (ana)	-0.004 (0.015)	0.014 (0.019)	0 (0.022)	-0.015 (0.022)
HIR weights estimators				
Simple difference	-0.016 (0.019)	-0.009 (0.016)	-0.02 (0.036)	-0.021 (0.033)
WLS (with controls)	-0.001 (0.011)	0.01 (0.007)	0.004 (0.024)	0.017 (0.012)
Covariates	Discrete	Continuous	Discrete	Continuous
N	360	360	360	360

Standard errors into parenthesis. Ana means that the analytical variance is computed, bs means that the variance is estimated by bootstrap. Bootstrap variances : 250 replicates. Covariates include : male age, female age, annual income, number of kids, female education, male education, employment status of the female, total cost, value of the debt, value of downpayment

TABLE 4.20: Impact of marriage on credit constraints at the intensive margin : total cost

	total cost			
	ATT		ATU	
Simple difference	0.035 (0.024)	0.04 (0.024) *	0.035 (0.024)	0.04 (0.024) *
OLS (with controls)	0.038 (0.021) *	0.046 (0.021) **	0.038 (0.021) *	0.046 (0.021) **
Oaxaca Blinder	0.038 (0.025)	0.057 (0.022) ***	0.039 (0.024)	0.044 (0.022) **
Matching estimators				
Kernel (ana)	0.045 (0.027) *	0.052 (0.026) **	0.032 (0.025)	0.051 (0.025) **
Kernel (bs)	0.045 (0.026) *	0.052 (0.022) **	0.032 (0.026)	0.051 (0.025) **
Mahalanobis (ana)	0.065 (0.03) **	0.075 (0.032) **	0.047 (0.039)	0.058 (0.039)
Nearest Neighbors (ana)	0.061 (0.015) **	0.055 (0.026) **	0.022 (0.026)	0.051 (0.026) **
HIR weights estimators				
Simple difference	0.041 (0.018) **	0.062 (0.018) ***	0.035 (0.043)	0.034 (0.044)
WLS (with controls)	0.035 (0.017) **	0.057 (0.016) ***	0.039 (0.039)	0.044 (0.04)
Covariates	Discrete	Continuous	Discrete	Continuous
N	362	367	362	367

Standard errors into parenthesis. Ana means that the analytical variance is computed, bs means that the variance is estimated by bootstrap. Bootstrap variances : 250 replicates. Covariates include : male age, female age, annual income, number of kids, female education, male education, employment status of the female, value of the debt, value of downpayment, % of dowpayment

TABLE 4.21: Impact of marriage on credit constraints at the intensive margin : annual income

	Annual income			
	ATT		ATU	
Simple difference	114 (1219)	1310 (1158)	114 (1219)	1310 (1158)
OLS (with controls)	715 (868)	1493 (601) **	715 (868)	1493 (601) **
Oaxaca Blinder	-286 (1301)	1085 (828)	996 (1216)	1694 (771) **
Matching estimators				
Kernel (ana)	-881 (1660)	373 (1451)	246 (1494)	1505 (1356)
Kernel (bs)	-881 (1409)	373 (1171)	246 (1591)	1505 (1460)
Mahalanobis (ana)	-471 (1763)	857 (1588)	-113 (1688)	2381 (1638)
Nearest Neighbors (ana)	-899 (0.015)	1788 (1235)	761 (1604)	2126 (1391)
HIR weights estimators				
Simple difference	-1042 (1130)	574 (1017)	-404 (2044)	827 (1891)
WLS (with controls)	-51 (783)	1303 (480) ***	620 (1437)	1365 (1029)
Covariates	Discrete	Continuous	Discrete	Continuous
N	360	367	360	367

Standard errors into parenthesis. Ana means that the analytical variance is computed, bs means that the variance is estimated by bootstrap. Bootstrap variances : 250 replicates. Covariates include : male age, female age, number of kids, female education, male education, employment status of the female, value of the debt, value of downpayment, % of dowpayment, total cost

8.7 Propensity score

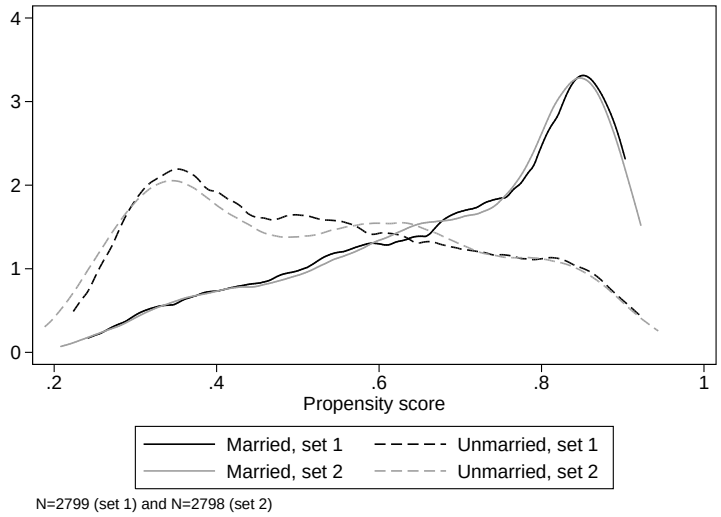


FIGURE 4.3: Distribution of the propensity score for $P(m_i = 1|X_i)$, for constraints at the extensive margin

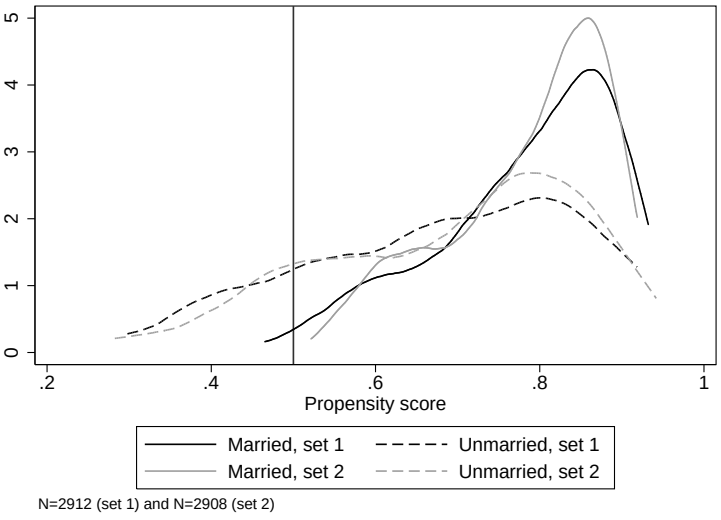


FIGURE 4.4: Distribution of the propensity score for $P(m_i = 1|X_i)$, for constraints at the intensive margin

8.8 Weights

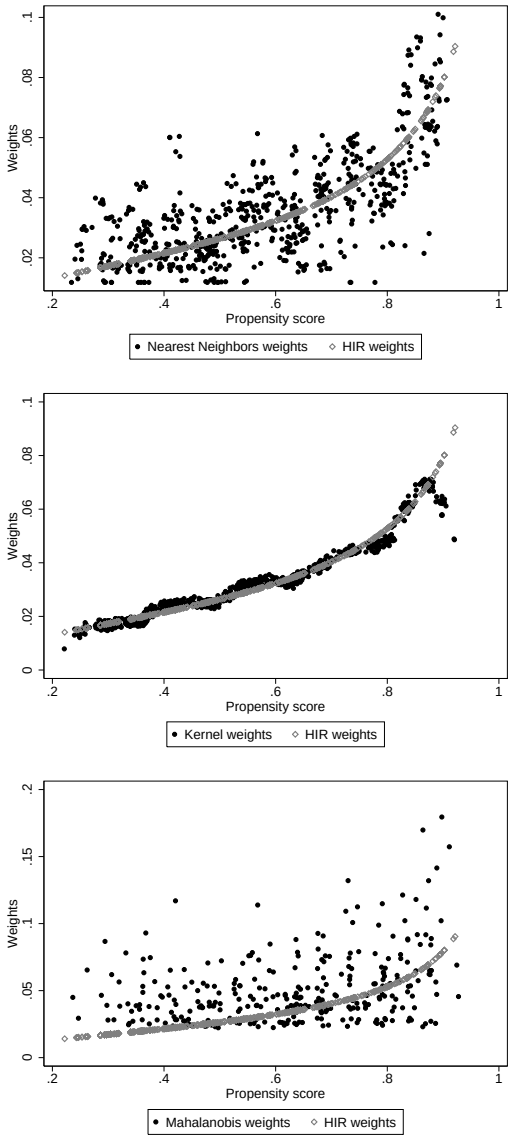


FIGURE 4.5: Comparison of weights - credit constraints at the extensive margin - Treatment=married

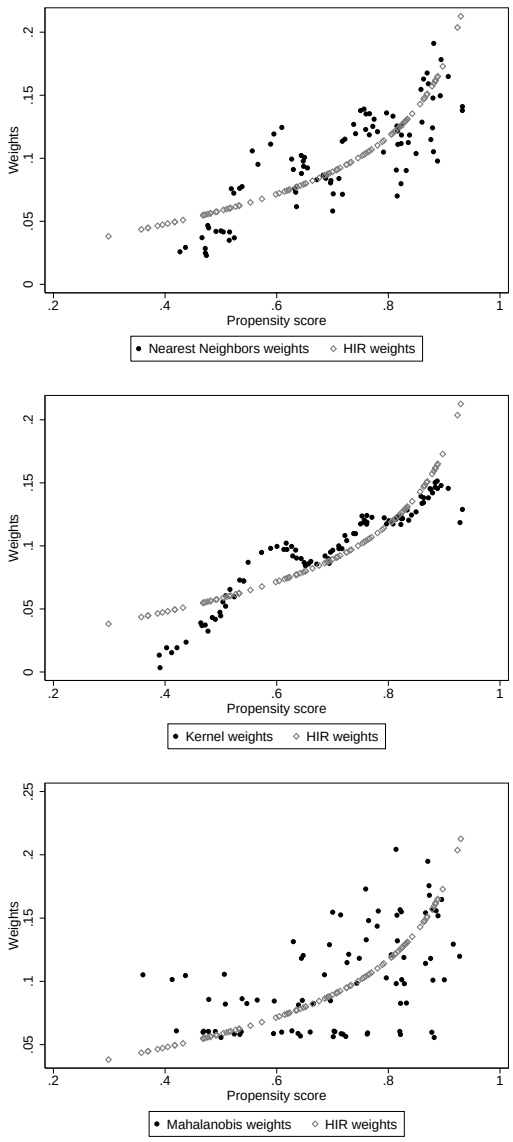


FIGURE 4.6: Comparison of weights - credit constraints at the intensive margin - Treatment=married

CHAPITRE 5

Conclusion générale

La mariage en tant que contrat a été peu étudié dans la littérature économique. Les choix opérés au niveau du ménage en termes d'offre de travail ou de fécondité ont largement été examinés en économie de la famille, sans pour autant distinguer les couples mariés des couples non mariés. En omettant la différence introduite par le statut matrimonial du couple, l'ensemble des travaux reposent ainsi sur l'hypothèse que le statut matrimonial n'influence pas les décisions prises au sein du couple. Pourtant, cette hypothèse est mise à mal par plusieurs constats. D'abord, les divers travaux s'appuyant sur la théorie de ménage collectif tendent à vérifier l'idée selon laquelle le ménage n'agit pas comme s'il maximisait une seule fonction d'utilité mais que ses décisions sont le fruit d'une négociation au sein du ménage entre plusieurs agents distincts. Ainsi, dès lors que le mariage modifie la répartition des ressources entre les membres du couple, il peut entraîner une modification des choix opérés au sein du ménage. Or, le mariage introduit une nouvelle entité économique et juridique, en reconnaissant la

communauté créée par le couple et en définissant des droits de propriété aux conjoints sur les biens produits par le couple. Ensuite, le recours au mariage a été profondément modifié : l'âge au premier mariage a reculé, la cohabitation précédant le mariage s'est généralisée et le nombre de divorce a fortement augmenté. Cette modification des comportements vis-à-vis du mariage indique que la fonction du mariage a pu évoluer. De plus, l'offre de contrats maritaux s'est diversifiée dans de nombreux pays, principalement en Europe, avec la création d'unions civiles, contrats de couple distincts du mariage. En France, les couples hétérosexuels ont depuis 1999 le choix de se marier ou de conclure un Pacte Civil de Solidarité (pacs).

L'objet de cette thèse est d'apporter des éléments de réponse afin de déterminer si le statut matrimonial est neutre dans la vie économique des couples. Ces éléments ont pour but de mieux comprendre l'évolution du paysage matrimonial au cours des dernières décennies.

Le premier chapitre s'intéresse à l'impact de la fiscalité sur le choix de conclure un pacs. En étudiant la mise en place de la réforme fiscale des couples pacsés de 2005, il montre que les couples sont sensibles aux incitations fiscales lorsqu'elles rendent le pacs plus avantageux qu'il ne l'était, sans pour autant le rendre plus avantageux que le mariage. La fiscalité permet de modifier le revenu des agents : ce chapitre montre donc que le statut matrimonial est élastique au revenu. Par ailleurs, ce chapitre innove sur la technique d'estimation de l'effet d'un traitement sur un outcome, en proposant une méthode d'estimation basée sur la triple différence, qui permet d'estimer des bornes à l'effet du traitement quand le groupe de contrôle est également affecté par le traitement.

Le second chapitre interroge les liens entre le pacs et le mariage. Il cherche à déterminer si le pacs a modifié les comportements matrimoniaux des couples, et en particulier s'il se substitue, au moins partiellement, au mariage. En étudiant l'évolution

de la distribution des âges au premier mariage de cohorte en cohorte, il montre que l'évolution n'a pas connu de rupture majeure après la mise en place du pacs. Ainsi, le pacs ne semble pas se substituer au mariage : il serait donc une forme de contrat alternatif qui touche des populations qui ne se seraient pas mariés, ou du moins, qui se sont pacsés à une période de leur vie au cours de laquelle elles n'auraient pas été mariées. Ce chapitre met donc en valeur le fait que le pacs, en diversifiant l'offre de contrats maritaux disponibles, a rendu visible une demande pour des contrats maritaux différents. Il indique ainsi que l'officialisation d'une union relève d'un choix s'appuyant sur plusieurs critères et qu'il ne peut pas être seulement étudié, comme il l'est souvent, en exploitant la seule source de variation introduite par la modification des coûts de divorce.

Le troisième chapitre examine l'effet du statut matrimonial sur les contraintes de crédit. Il se base sur l'idée que le mariage peut être perçu comme un signal de la qualité du couple pour des tiers interagissant avec le couple en tant qu'acteur économique. Ainsi, le mariage peut être interprété par la banquier comme un signe de la détermination du couple à rester ensemble. Ce chapitre cherche à tester cette hypothèse en étudiant l'accès au crédit immobilier : son but est de déterminer si les couples mariés voient leur accès au crédit facilité étant donné leur statut matrimonial et s'ils bénéficient de conditions de crédit plus avantageuses que les couples non mariés. Les résultats tendent à montrer que les couples mariés bénéficient d'un meilleur accès au crédit, mais qu'ils souffrent en revanche de conditions de crédit détériorés par rapport aux couples non mariés. Ce résultat peut être interprété comme un effet de sélection des couples dans le mariage : les couples les plus enclins à acheter, quelles que soit les conditions d'emprunt, sont aussi plus à même de se marier.

En montrant que le statut matrimonial peut être influencé par des questions économiques et qu'il peut en retour modifier la vie économique des agents, cette thèse

met en valeur le fait qu'il est important de considérer qu'il existe une différence entre couples mariés et couples non mariés lorsque les choix des ménages sont étudiés.

Les travaux présentés dans cette thèse suggèrent qu'un travail plus approfondi sur les raisons d'officialiser son union, sur la dynamique matrimoniale et sur les conséquences économiques de l'union pourrait apporter des éléments de réponses à l'évolution des sociétés occidentales contemporaines. Néanmoins, un tel travail nécessite des comparaisons internationales. Or celles-ci sont difficiles à établir en matières de choix matrimoniaux, car ils dépendent d'un grand nombre de facteurs sociaux. Par ailleurs, une limite à la comparaison internationale provient de la difficulté à identifier les effets des réformes sociales sur les comportements des couples. Cette limite, inhérente à tout travail sur l'adaptation des comportements à une modification du cadre légal, provient du fait que les réformes, en particulier en matière matrimoniale, sont rarement mises en place de façon exogène : elles apportent souvent un cadre légal à une pratique déjà observée et sont induites par les comportements des couples. En retour, elles peuvent renforcer voire inciter de nouveaux comportements. Ainsi, il est souvent difficile de dégager les effets du cadre légal sur le comportement des couples. Par conséquent, les comparaisons internationales, si elles apportent de la variation en termes de système légal, sont difficiles à établir, et de la même façon, les effets mis en avant dans cette thèse peuvent difficilement être étendus à d'autres sociétés.

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Résumé

Cette thèse porte sur les impacts économiques du pacs et du mariage en France. Elle s'articule autour de trois axes. Le chapitre 2 évalue l'impact de la fiscalité sur le nombre de pacs contractés en France. Le chapitre 3 cherche à déterminer si le pacs se substitue au mariage en étudiant l'évolution des taux de mariage et de l'âge au premier mariage depuis la mise en place du pacs in 1999. Le chapitre 4 s'interroge sur l'impact économique du mariage en évaluant l'effet du mariage sur les contraintes de crédit des couples. Si la fiscalité a joué un rôle indéniable dans la progression du nombre de pacs contractés chaque année en France, celui-ci ne semble pas avoir augmenté au détriment du mariage, dont l'évolution récente prolonge la modification du paysage matrimonial observée depuis 25 ans, à savoir une baisse des taux de mariage et un recul de l'âge au premier mariage. Si la baisse du nombre de mariages contractés, associée au développement de la cohabitation hors mariage introduit une distinction entre couples non-mariés et couples mariés, ces derniers ont plus souvent des projets d'investissement mais ils ne sont pas pour autant avantagés sur le marché du crédit. Ils souffrent de plus mauvaises conditions d'emprunt, traduisant une sélection dans le mariage des couples les plus enclins à investir.

Mots-clés : Mariage, Pacs, Fiscalité, Différence de différences, Quantiles, Contraintes de crédit

Abstract

This dissertation examines the economic impacts of Civil Union (pacs) and marriage in France. It is divided into three chapters. Chapter 2 evaluates the effect of taxation on the number of pacs contracted in France. Chapter 3 aims at determining if the pacs is a substitute to marriage. On that purpose, it analyzes the evolution of marriage rates and the evolution of the age at first marriage since the pacs has been created in 1999. Chapter 4 questions the economic impact of marriage : it estimates the impact of marriage on credit constraints of couples. Taxation had a clear impact on the increase in the number of contracted pacs by year. But the evolution of the number of pacs has not decreased the number of marriages. The recent trends exhibit declining marriage rates and increasing ages at first marriage but they are a continuation of previous trends observed for the last 25 years. The decline in the marriage rates, joined with the development of cohabitation introduces a difference between unmarried and married couples. The latter are more likely to form investment projects but they do not benefit from their marital status on the credit market. They suffer bad terms of credit, indicating that marriage selects couples more willing to invest in housing.

Keywords : Marriage, Civil Union, pacs, Taxation, Difference in difference, quantiles, credit constraint