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Fueling the Gender Gap? Oil and Women's Labor and Marriage Market Outcomes

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Abstract

This paper analyzes the effect of resource-based economic specialization on women's labor market outcomes. Using information on the location and discovery of major oil fields in the Southern United States coupled with a county-level panel derived from US Census data for 1900-1940, we specifically test the hypothesis that the presence of mineral resources can induce changes in the sectoral composition of the local economy that are detrimental to women's labor market outcomes. We find evidence that the discovery of oil at the county level may constitute a substantial male biased demand shock to local labor markets, as it is associated with a higher gender pay gap. However, we find no evidence that oil wealth lowers female labor force participation or has any impact on local marriage and fertility patterns. While our results are consistent with oil shocks limiting female labor market opportunities in some sectors (mainly manufacturing), this effect tends to be compensated by the higher availability of service sector jobs for women who are therefore not driven out of the labor market.

Key words: Oil, structural transformation, female labor force, participation, gender pay gap
JEL: R1; N5; O1; J1

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1 Introduction

One of the most salient developments in labor markets in the post-war period has been the mass entry of women into the labor force. This development, however, has not been universal, with some countries displaying slow progress or even stagnation in women's labor market involvement. For example, while female labor force participation has increased in the United States from 33% in 1950 to more than 68% in 2005, in the latter year it still stood at less than 19% in Saudi Arabia (Olivetti 2013). A vast literature has analyzed these patterns and has documented the importance of both supply-side and demand-side factors, as well as the role of changing social norms.[1] Among the theoretical frameworks that have been proposed to explain the limited progress made by some countries in integrating women into the labor market, a theory that links disappointing labor market outcomes for women to natural resource specialization has received particular attention. According to this theory, first proposed by Ross (2008), heavy exposure of an economy to the mineral extraction sector, and in particular to oil extraction activities, can depress both employment opportunities for women as well as women's incentives to participate in the labor market. In turn, a more limited involvement of women in the labor market may bring about a number of other malign effects, including a diminished influence for women in the political process. In essence, the argument made by Ross (2008) amounts to positing another facet of the "resource curse":

[1] See Goldin(1990, 2006) for overviews of female labor force participation in the US. Concerning supply-side explanations, Goldin and Katz (2002) and Albanesi and Olivetti (2009) document the importance of medical avances such as contraceptives and infant formula; Jones, Manuelli and McGrattan (2003) and Greenwood, Seshadri and Yorukoglu (2005) focus on the role of labor-saving technological progress in the production of household goods. Finally, Attanasio, Low and Sanchez-Marcos (2008) emphasize declining child care costs. Regarding demand-side determinants of women's increasing labor market involvement, the most relevant study for the arguments made in this article is perhaps Ngai and Petrongolo (2014), who highlight the importance of the structural transformation from manufacturing into services and the increased marketization of home services. Other papers that employ structural transformation arguments to describe gender roles and their evolution include Voigtlaender and Voth (2013), Akbulut(2011) and Alesina, Giuliano and Nunn (2013). Some other papers that rely on demand-side arguments focus on the importance of trade integration as factor that can expand labor market opportunities for women, particularly in developing countries (see Do, Levchenko and Raddatz 2012). Finally the work by Fernandez (2011, 2013) is representative of the strand of literature that emphasizes the role of social norms in the recent advanced made by women in labor markets. Among the authors that have attributed adverse female socioeconomic outcomes to religious factors we note Sharabi (1988), World Bank (2004), which have both emphasized the role of Islamic traditions, while among the studies that have emphasized the role of natural resource specialization, perhaps the most prominent is Ross(2008). Klasen and Pieters (2013) analyze the determinants of continued low female labor force participation in India, and find evidence of adverse factors operating through both demand-side and supply-side channels, as well as through conservative social norms.

resource wealth may undermine or slow down economic and social development by hindering the economic and political emancipation of women.

In this paper, we empirically analyze the effect of resource based specialization on female labor and marriage market outcomes in a within country, developed nation setting. Using county-level data on major oil discoveries in the US South between 1900 and 1940 and labor market data from the census, we employ a difference-in-difference research design, comparing oil rich counties to those without major oil deposits, before and after the discovery of the respective oil fields. We find that oil discoveries constitute a substantial shock for the local economy that leads to increased urbanization, a larger and younger population and sectoral reallocation of employment from agriculture into oil mining and manufacturing. However, these changes do not translate into lower female involvement in the labor market: We find that neither the female labor force participation rate nor the female employment rate change, and women's labor supply at the intensive margin remains unaffected as well, while male labor force participation increases only slightly.

While these results indicate that the effects of the oil discovery shocks on quantities transacted in local labor markets are small, we find a substantial impact on the local price of labor that differs by gender. Oil discoveries are associated with substantial wage rises, with average wages in oil rich counties being around 32 log points higher than in baseline counties after oil discovery. However, the benefits associated with these discoveries accrue chiefly to men, whose average wages increase by around 36 log points, while the corresponding effect for women amounts to only 11 log points and is not statistically significant. The findings concerning wages thus seem to lead to the conclusion that oil discoveries might have constituted substantial male biased shocks to local labor markets, but their effects operated largely through prices (e.g. wages) and not through quantities (e.g. gender specific labor force participation, employment or the gender ratio). In order to understand the channels that can help account for the absence of a quantity effect in local labor markets, we study the evolution of employment in 4 major sectors by gender and find that men reallocate from agriculture into oil mining and manufacturing, while women reallocate from agriculture into services. The increased absorption of women into the locally expanding service sector might thus be one explanation for our failure to detect any changes in female labor force participation and employment.

Finally, drawing on a sizable literature linking women's labor market success to other socioeconomic outcomes, we also study whether oil discoveries can be found to have any impact on women's marriage market outcomes. We fail to find any relation between oil discoveries and marriage rates and women's age at first marriage, while we identify a significant negative correlation between discovered oil fields and fertility. However, upon more careful inspection we are able to show that this result is largely "compositional", and is driven by the fact that oil discoveries are associated with a shift in the age distribution of oil-rich counties towards younger populations.

All in all, our findings are consistent with two separate interpretations. One interpretation, that emerges from focusing on our labor force participation and employment results, suggests that the initial male-biased demand shock (oil and manufacturing grow, employing more men) is absorbed in the longer run as the local economy grows, becomes more urbanised and demands more services that tend to employ women. This is in line with the mechanism described in Ross (2008, 2010), where segregated labor markets and, importantly, the absence of a sector that can absorb "excess"female labor are both essential conditions for oil to have the effect of lowering female labor market participation.

A second interpretation of our results, that emerges from placing an emphasis on our wage findings, may point to the conclusion that the discovery of oil may indeed amount to a male-biased shock to local labor markets, but one that operates mostly through prices (wages) rather than quantities (labor force participation, employment rates or the gender ratio). However, this interpretation leaves a series of substantive questions unanswered. A first such question concerns the mechanics that could lead to the labor market demand and supply shocks brought about by the discovery of oil to operate in a way that affects only wages but not the amount of labor supplied by different groups of workers. Accounting for this inelasticity of the labor supply on the intensive margin, with participation rates in the labor market virtually unchanged, while the extensive margin represented by immigration is clearly active is not straightforward. Another important open question in this context is whether widening gender pay gaps can be expected to produce some of the same malign socioeconomic developments that have been linked with low rates of female labor force participation.

In a broader context, our findings also highlight that an initial gender-biased demand shock that affects one sector (or a subset of sectors) of the economy need not necessarily lead to gender-biased outcomes in the aggregate: If such a shock (for example via backward or forward linkages to other sectors or via income effects) generates further growth in other sectors, we may not observe differential changes for male and female aggregate outcomes.

We are not the first to study the relationship between resource wealth and female labor market outcomes. In a cross-country setting, Ross (2008) found a negative relationship between oil production and female employment. However, competing studies, such as Norris (2010), argue that this analysis is invalid, as it suffers from omitted variable bias and measurement error, and its main results are driven by a small number of outliers. Our empirical set-up is able to address these and other issues: By analyzing a within country sample, we are able to avoid some of the issues concerning the pre-existing differences between the "treated" and "untreated" units of analysis, which is substantially more difficult in the cross-country set-ups of previous studies. Moreover, by exploring the time dimension of our panel, we can more cleanly disentangle the impact of oil wealth on the outcomes of interest than was possible in some of the existing work. Finally, by focusing on discoveries of large oil fields as our explanatory variable, we avoid some of the endogeneity concerns that might arise in relation to previous studies that employ other measures of resource specialization of local economies, such as the amount of natural resources actually extracted or the amount of resource revenues derived by a local economy.

Beyond the literature analyzing the determinants of women's socieconomic outcomes discussed above, the present article is also related to the body of work assessing the long-run economic impact of mineral wealth, and in particular to the strand of literature investigating the "Resource Curse"hypothesis (Corden and Neary 1982; Auty 1993; Sachs and Warner 1995, 2001; Engermann and Sokoloff 1997; Papyrakis and Gerlagh 2004; Humphreys et al. 2007; Lederman and Maloney 2007; Brunnschweiter and Bulte 2008; Lei and Michaels 2013 etc.). Moreover, our paper is particularly closely related to the strand of literature investigating the economic impact of natural resources in within-country settings (Pratt 1980, Papyrakis and Gerlagh 2007; Black, McKinnish and Sanders 2005; Domenech 2008; Michaels 2011; Caselli and Michaels 2013; Furchtgott-Roth and Gray 2013).

The rest of this paper is organized as follows. Section 2 reviews some of the consequences of female labor force participation while Section 3 discusses the channels through which oil discoveries could influence women's labor and marriage market outcomes. Section 4 proceeds to describe the data we use in this study and our empirical strategy, while Section 5 presents our results. Section 6 presents some robustness checks. Section 7 concludes.

2 The Consequences of Female Labor Force Participation

Perhaps the most immediate argument that can be employed to motivate the substantial interest devoted to analyzing the determinants of women's labor market outcomes involves citing the large economic costs that are being incurred as a result of women facing limited labor market opportunities in many parts of the world (Dollar and Gatti 1999; Loko and Diouf 2009; Cuberes and Teignier 2012). Estimates by Aguirre et al. (2012) suggest that raising the female labor force participation rate to country specific male levels would have substantial positive effects on overall output in many countries (for example it would raise GDP in the United States by 5 percent, in Italy by 11 percent, in the United Arab Emirates by 12 percent and in Egypt by 34 percent). Perhaps even more significantly, Aguirre et al. (2012) make use of International Labor Organization (ILO) data to estimate that out of the 865 million women worldwide who have the potential to contribute more fully to their national economies, 812 million live in emerging and developing nations.[2]

Beyond their instrinsic interest and economic implications, female labor market outcomes have drawn extensive attention also because of their knock-on impact in other spheres, such as the family, society at large and even the political process. In particular, women's involvement in the labor market, reflected in measures such as the female labor force participation rate, has been found across several strands of social science literature to be robustly linked to a series of significant socioeconomic developments affecting women.

Some of the most significant effects that have been attributed to increased female participation in the workplace concern marriage and fertility. Research has shown that women respond to improved labor market opportunities by postponing (Jensen 2012) and sometimes even foregoing marriage (Buchman, DiPrete and McDaniel 2008). Some studies have also found associations between elevated female labor force participation rates and increases in the incidence of divorce (Michael 1985, Bremmer and Kesselring 2004). Alongside delayed marriage, female involvement in the labor market has also been linked to lower fertility rates. Potential explanations for this link include increased oportunity costs of women's time and the role of time spent in activities such as education and training (Brewster and Rindfuss 2000). Equally importantly, increased female labor force participation appears to play a role in encouraging human capital acquisition by women. Michael (1985), for example, finds that improved female labor force participation rates have raised female school enrollment.

Schlozmann, Burns and Verba (1999) also link women's involvement in the workplace to measures of female political participation. They find that women with jobs develop more skills that are useful in the political sphere and are often recruited "at work"for political activities. In addition, women who are active in the labor force seem to experience more gender discrimination, which further leads to increased political activity.

Finally, female labor force participation can affect gender relations in broader terms. Studies of female garment workers in Bangladesh, for example, have found

[2]The above discussion of the macroeconomic costs generated by limited involvement of women in the labor market draws heavily on a similar treatment undertaken in IMF Staff Discussion Note SDN/13/10 (2013), while the discussion of the impact of female participation in the labor force on various socioeconomic outcomes that follows draws on the literature review contained in Ross (2008).

that factory work helps women gain self-confidence, a sense of modernity, and negotiating skills that are useful when dealing with men. (Amin et al. 1998; Kabeer and Mahmud 2004). Moreover, independent sources of income for women are also associated with greater influence in the family (Beegle, Frankenberg, and Thomas 2001; Iverson and Rosenbluth 2006).

3 The Impact of Oil Wealth on Women's Labor Market Outcomes

Before we proceed to the main body of our analysis, in this section we aim to provide a brief discussion of the mechanisms through which oil wealth could affect the labor market outcomes of women. The existing work (see for example Ross 2008 and 2010), which has largely focused on the impact of oil wealth in cross-country settings, has identified both demand side and supply side channels that could lead to oil wealth (and other types of mineral wealth) having an adverse impact on women's involvement in the labor market.

Focusing first on the effects of oil wealth on the demand side of labor markets, the literature has highlighted that large mineral endowments tend to encourage economic specialization in natural resource extraction and its associated sectors. Moreover, to the extent that resource extraction activities compete for scarce inputs (land, labor, capital) with other, non-related sectors, large resource endowments may be associated with these latter sectors being crowded out. As resource mining and its associated activities tend to display heavily male labor forces, while many of the sectors at risk of being crowded out by resource extraction exhibit greater gender balance in their labor forces, this readily yields a scenario in which resource wealth tends to crowd women out of the labor market by reducing the demand for female labor.

Oil wealth can also affect the supply side of the labor market by reducing women's incentives to participate in the workplace. Thus, the discovery of large mineral resource deposits may lead to a sharp rise in the demand for male labor which can often translate into substantially higher male wages. Given that a sizable literature in labor economics (e.g. Goldin 1990) has documented the existence of a substantial negative elasticity of married women's labor supply with respect to their husband's wages, this yields another channel through which oil wealth can depress female involvement in the labor market.

It is important to stress, however, that the channels of transmission of resource shocks to the labor market discussed above were proposed in the context of a literature that focuses on cross-country analyses. In such cross-country settings national labor markets can be considered as "closed", as international migratory flows are usually quite small relative to the size of national workforces and can thus be safely omitted from the analysis. By contrast, in a within country context of the type we analyze in the present study, the assumption of a "closed" labor market becomes notably less attractive, as within country migratory flows can be important relative to the size of sub-national labor markets. Once the importance of migratory flows between sub-national units, in our case US counties, is recognized, it becomes clear that the mechanisms outlined above might be upset by the operation of the migration margin, as any cross-county differences brought about by the presence of mineral wealth may be arbitraged away by migratory flows. As a result, great care has to be taken when attempting to transfer the predictions of the cross-country theoretical frameworks briefly outlined above to the study of US counties undertaken in this paper.

With the above caveat in mind, it is important to note that it is quite straightforward to construct a theory of regional economies that retrieves many of the qualitative predictions made by the cross-country theoretical frameworks outlined above. The conceptual framework we adopt to guide our empirical work is a modified version of the one outlined in Moretti (2010). In our framework, we assume that the optimising agents are represented by households which are made up of one man and one woman (i.e. we impose that marriage markets clear at all times) and which choose their location in order to maximize joint household utility. In the simplest setting we consider the case in which the economy contains two sectors, a male sector and a female sector. Moreover, in keeping with Moretti (2010) we assume that households have intrinsic preferences defined over locations, which implies that shocks affecting regional economies can have a differential impact on the welfare of inframarginal households.

In a setting of this type we can interpret the discovery of oil wealth at the county level as an increase in the local productivity of the male sector. This will tend to put upward pressure on male wages in the newly oil-rich county. In response to this, we can expect households from other counties to migrate to the county benefitting from an oil discovery. However, as moving households also contain women, this will tend to symmetrically increase the supply of both male and female labor. Given that women, at least in the first instance, do not benefit from a proportional increase in the demand for their labor services, we may expect female wages to experience a relative decline. In the presence of any labor market frictions or reservation wages, this may, in turn, discourage female participation in the labor market. All in all, should this scenario come to pass, we may expect to observe diverging wage rates and labor force participation rates between men and women (with participation rates for the latter potentially declining) in counties that benefit from oil discoveries, which is in line with the predictions concerning the effects of oil wealth derived from cross-country theoretical frameworks.

However, as the discussion above should make clear, the prediction that oil wealth has a negative impact on women's labor market outcomes is by no means a general result. It is in fact quite straightforward to construct scenarios in which oil wealth can be expected to have no impact on women's labor market success. The simplest such scenario would involve a context in which labor markets are not segregated by gender and female and male labor are perfect substitutes. In such a context oil discoveries (or for that matter any other shocks to labor markets) would not have a gender biased effect on local labor market opportunities. A perhaps more realistic setting in which we would expect the effects of oil discoveries on labor market opportunities for women to be subdued would involve the presence of a sector that finds itself on the employment margin between hiring male or female labor. If this sector is sufficiently large and it is not hurt (or is even helped) by the discovery of oil, then it could absorb the excess female labor that results from the composition of employment in other parts of the economy shifting in favor of men. A prime candidate for such a role is the service sector, in which women are thought to have a comparative advantage and which is unlikely to be crowded out by the oil sectors and sectors connected to it (in fact the service sector may indeed benefit from the discovery of resource wealth).

Finally, it is important to note that the final setting discussed above can be slightly altered to lead to the result that oil discoveries may even *enhance* labor market opportunities for women. Thus, in a context in which oil extraction and its connected sectors are not very male biased or simply are not labor intensive, such that their growth does not represent a substantial shock to local labor markets, it could nonetheless be the case that oil discoveries increase local incomes (say through higher profits for local capitalists, or rents or royalties for local landowners). If preferences are non-homothetic and services play the role of the "advanced goods", then a rise in local incomes may lead to a substantial increase in the demand for services. In turn, women are habitually thought to have a comparative advantage in the delivery of many of these services, such that the overall result of oil discoveries in such a scenario may in fact be an expansion of labor market opportunities for women.[3]

4 Data and Empirical Strategy

This section describes the dataset we employ in our empirical verification of the link between major oil field discoveries and women's socioeconomic outcomes and also sets out the empirical specifications that we estimate in the following section.

[3]Ross (2008) makes a similar argument based on a Dutch Disease story: If oil leads to a depression of the traded goods sector, but an increase in non-traded goods, then the openness of the non-traded goods sector towards women will be crucial.

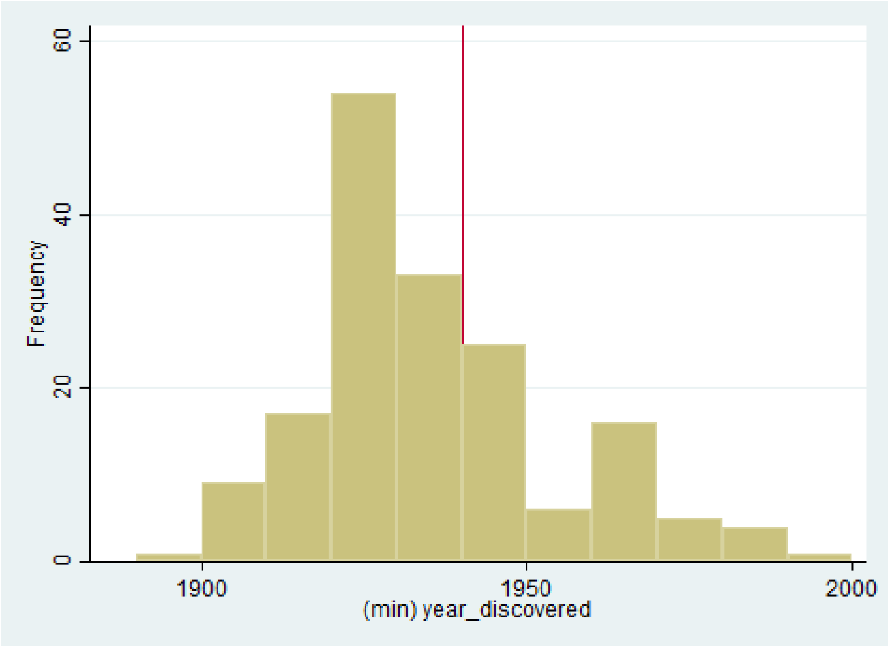

Figure 1: Number of Large Oil Fields Discovered, by Decade

We begin by drawing on the dataset built by Michaels (2011). This dataset was constructed on the basis of the Oil and Gas Journal Data Book (2000), a document which lists the name of all US oil fields that had at least 100 million barrels of oil before any oil was extracted from them. In line with Michaels (2011) we call these simply "large"oil fields. For each of these large oil fields, the data book details the amount extracted by 1999 and the amount that was projected to have remained at that time. The dataset allows us to build an almost exhaustive picture of major oil field discoveries over the period 1890 to 2000. Large oil fields are first discovered in the US South after 1890. After that, the hazard rate of discovery of new fields is found to increase sharply in the period between 1890 and 1930 and to fall quite rapidly in the subsequent decades (see Figure 1).

The case of the US South is interesting in its own right, as it remained noticeably underdeveloped relative to the North for an extended period of time (Wright 1986, Caselli and Coleman 2001) and has traditionally tended to display more conservative social norms on a series of issues, including gender (Rice and Coates 1995, Twenge 1997), but it can also serve to inform the discussion concerning the links between resource specialization and female outcomes in a wider context.

Due to data limitations, we restrict the timeframe of our analysis to the period 1900 to 1940. However, this period is also particularly interesting for our analysis: Firstly, during this period, oil extraction is still a relatively labor intensive sector, such that in counties that benefit from large oil discoveries the oil sector employs a notable share of the labor force. To the extent that oil extraction itself is a sector that heavily employs men (which can be shown to indeed be the case), then the growth of the oil sector in oil-rich counties could itself be a "gender biased" shock to local labor markets, which could lead to some of the dynamics described in the previous section. In the final few decades of the twentieth century however, the oil sector becomes less and less labor intensive, such that it is not an important employer even in oil-rich counties, and as a result its importance as a "gender biased" factor affecting local labor markets is likely to be much smaller. Secondly, the case of the US in the first half of the twentieth century, when it was a substantially poorer and more conservative country than it is today, is more informative than an analysis carried out over a more recent time period for assessing the potential impact of similar resource shocks in some of today's developing countries.

Due to the time profile of new oil field discoveries, our period of interest contains more than two thirds of the major oil field discovery events recorded over the entire period 1890 to 2000. The maps depicted in Figures 2 to 6 show the evolving geography of oil discoveries in the period 1900 to 1940. They are based on county shape files of the United States available through the National Geographic Information System.

Michaels (2011) identifies oil-rich counties by matching major oil fields with the counties located above them by making use of the Oil and Gas Field Code Master List (2004). A county is defined as oil abundant if it lies above at least one large oil field. As a result of the matching of counties and oil fields, a total of 222 oil abundant counties are identified in the United States, about 150 of which are found in three adjacent states in the Southern US: Texas (107 counties), Oklahoma (24 counties) and Louisiana (19 counties). In order to focus our analysis on counties that are fairly similar in all but their oil abundance, we follow Michaels (2011) in restricting the sample to counties that are within 200 miles of the oil abundant counties of Texas, Oklahoma and Louisiana. This leaves us with a panel of 774 counties, 171 of which are oil abundant and 119 of which experience a major oil discovery event during the period 1900 to 1940.[4]

To estimate the impact of oil abundance on our variables of interest, we estimate two main types of specifications. For the outcome variables of interest that we can observe over multiple time periods in our sample we estimate regressions of the form:

$$y_{ct} = \alpha_c + \tau_t + \beta DiscoveredOilField_{ct} + \eta NeighborOilField_{ct} + X_c' \gamma_t + u_{ct} \quad (1)$$

[4]Since we include all counties within 200 miles of the oil abundant counties in the 3 mentioned states, we also include 21 oil abundant counties in Alabama, Arkansas, Florida, Kansas, Mississippi and New Mexico, giving a total of 171 oil abundant counties. However, we operate with a more limited sample for earlier time periods, particularly for the year 1900. In particular, we drop all counties in Oklahoma and the Indian Territories in 1900, as these territories underwent substantial territorial reorganizations afterwards.

where y_{ct} measures outcomes in county c at time t, as described below, while α and τ are county and time fixed effects, respectively, and X_c is a set of county level controls based on the Michaels (2011) dataset. Our explanatory variable of interest, $DiscoveredOilField_{ct}$, equals 1 if the county is oil abundant and its oil field has already been discovered and 0 otherwise. We also include a control variable for counties without discovered oil fields, but that border counties with such a field: ($NeighborOilField_{ct}$) is 1 if any of the neighbors of county c has a discovered oil field by time t, and 0 otherwise. This variable is included in the regression to control for potential spillover effects associated with a neighbor discovering a large oil field.

For a smaller set of outcomes of interest, data limitations[5] force us to perform the analysis of the impact of oil discoveries on a cross-section of counties observed in the year 1940. In these cases we estimate empirical specifications of the form:

$$y_c = \alpha + \beta DiscoveredOilField_c + \eta NeighborOilField_c + X_c'\gamma + s_c + u_c \qquad (2)$$

where y_c measures outcomes in county c in the census year 1940, X_c is the same set of county level controls employed in specification (1) and s_c is a state-level fixed effect. In this context, our explanatory variable of interest, $DiscoveredOilField_c$, equals 1 if the county is oil abundant and its oil field has already been discovered by 1940 and 0 otherwise. Similarly to the previous specification, for counties that haven't got a discovered oil field, the control variable $NeighborOilField_c$ takes a value of 1 if a neighbouring county has a discovered oil field in 1940 or zero otherwise.

The same set of control variables (included in the vector X_c) is used across all our specifications. These include: longitude, latitude, average annual rainfall, an indicator for arid counties, an indicator for semi-arid counties, distance to nearest ocean and distance to nearest navigable river. These variables are not affected by the oil industry and control for potentially spurious determinants of outcomes that might be correlated with our treatment. In the panel data specifications (specification of the form (1) outlined above) we allow the effect of these control variables to be potentially time-varying by interacting them with decadal time dummies.

Having discussed the right hand side variables of our main regression models, we now move to describe the construction of our outcome variables, denoted by y_{ct} in our panel specifications and by y_c in our cross-sectional specifications. The outcome variables are constructed using census data from the Integrated Public Use Microdata Series (IPUMS). The dependent variables we study using our panel data specification (specification 1 above) include: the log of county population older than 14, county-level urbanization rate (measured as urban population

[5]The most important outcome variable that we are forced to study cross-sectionally is wages. Wage data is unavailable pre-1940, and after 1940 publicly available data does not report county identifiers.

divided by overall county population), average age at the county level, the sex ratio at the county level (measured as the ratio of the local male population to the local female population), the share of the labor force at the county level employed in the 4 broadly defined sectors of agriculture, oil extraction, manufacturing and services, the share of the labor force at the county level employed in the aforementioned 4 sectors by gender, the labor force participation rate at the county level by gender (defined as men or women in the labor force/ total number of men or women of working age in the county, where working age is defined as older than 14), the employment rate at the county level by gender (defined as employed men and women/ total number of men or women in the labor force at the county level), the county level marriage rate (define as the share of women of marriage age who report being married), the average age at first marriage for women at the county level, fertility (defined as the number of children ever born) and fertility of women over 40 years of age.[6]

With our more limited cross-sectional specification for the census year 1940 (specification 2 described above) we study the following dependent variables: average wages at the county level by gender; and two measures of labor supply intensity of employed women at the county level, namely average number of weeks worked per year and average number of hours worked per week.

When constructing our outcome variables, we collapsed the individual-level data contained in IPUMS at the county-year level, using the dataset's person weights to improve representativity. All the regressions reported in the next section are additionally weighted using the county population in each year as weights. Furthermore, to address concerns that emerge from the fact that county boundaries experience changes during our period of analysis, in our panel specification we drop county∗year observations from our sample when the surface area of a county in the respective year differs by more than 5% from the same county's surface area in 1940.

As previously noted, the empirical strategy outlined above presents several advantages over previous work analyzing the consequences of natural resource specialization on women's outcomes. Firstly, it relies on a source of variation in resource abundance that is plausibly exogenous and not subject to endogeneity concerns that would arise in connection with other measures previously used such as contemporaneous oil production. In addition, due to using the information about the timing of oil field discoveries, we can employ a difference-in-difference-style research design, comparing the evolution of oil-rich counties before and after discoveries to that of non-oil counties. Focussing on a set of counties from the

[6] For most of these variables we have a full panel of counties covering the period 1900 to 1940. However our dataset does not include information on employment status for the years 1900 and 1920, on fertility (measured as the number of children ever born) for the years 1920 and 1930 and for the female age at first marriage before 1930.

same country (and even the same region) also helps us to address issues due to differences in institutions that are hard to control for in cross-country panels that previous studies have used. In our set-up, such institutional differences should be relatively small and not a major threat to identification. Finally, the case of the Southwestern United States offers us the advantages of analysing consistent, high-quality data from a region that at that time still relied heavily on agriculture. This is important because much of the discussion surrounding the link between resource abundance and gender issues has concentrated on developing, often heavily agrarian economies. Keeping these advantages in mind, we now turn to implementing our empirical strategy.

5 Results

Before 1900 the economy of the Southern United States was predominantly agricultural and the overwhelming majority of oil fields had not yet been discovered (see Figures 1 and 2). We begin our analysis by providing some suggestive evidence that oil-rich counties (virtually all of which would not have yet discovered oil) were not systematically different from counties that lacked any oil deposits when seen from the level of the starting year in our sample, 1900. For the year 1900 we have a restricted sample of only 580 counties, as the state of Oklahoma was largely unorganized by this point in time. With that caveat in mind in Table 1 we present, separately for oil-rich and non-oil counties, the sample averages of a battery of key variables[7] for the year 1900.

As can be seen, apart from population, the two groups of counties do not systematically differ at the level of the baseline year 1900 (the difference for the oil employment share is statistically significant, but economically irrelevant). These findings are reassuring as they imply that the oil wealth "treatment"can be seen as nearly randomly assigned and thus the setting we study constitutes a valid natural experiment. Based on these results , we proceed to set the stage for our main analysis relating resource shocks to gender outcomes by first checking whether oil field discoveries indeed represent important developments for the discovering counties. In particular we verify whether the discovery of major oil deposits can be found to have substantial effects on counties' economies and demographic characteristics.

To systematically assess the demographic impact of major oil discoveries at the county level, we employ our basic panel specification (specification 1 in the previous section) to study the evolution of some key demographic variables in oil-rich

[7] The variables included in Table 1, which contrasts the pre-oil discovery characteristics of oil-rich and baseline counties, are the log of population aged older than 14, female and male labor force participation rates, the urbanization rate, average number of children born for each woman, and the labor force shares of the oil sector, agriculture, manufacturing and services

Variable	Non Oil	Oil	t statistic of difference
Ln(Pop)	8.7829	8.3398	3.19***
	(1.1567)	(1.3635)	
Female LFP	.1688	.1524	1.29
	(.137)	(.1166)	
Male LFP	.9156	.9148	0.12
	(.0468)	(.0653)	
Ratio Urban Pop	.0517	.039	1.18
	(.1114)	(.1012)	
(mean) Children ever born	4.2666	4.4056	-1.64
	(.607)	(.8487)	
Oilshare	.0001	0	1.81*
	(.0013)	(.0001)	
Manushare	.0325	.035	-0.49
	(.0424)	(.0505)	
Agrishare	.6824	.6527	1.31
	(.1944)	(.2218)	
Servshare	.0909	.0965	-0.84
	(.058)	(.0652)	
Observations	531	135	

t-statistic refers to a t-test for differences in means, allowing for unequal variances
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 1: Oil vs Non-Oil counties in 1900 (before the discovery of oil)

counties relative to baseline counties. The findings of this analysis are presented in Tables 2 and 3. The results indicate that after the discovery of oil fields, oil-rich counties experience more rapid population growth than baseline countries and display notably higher urbanization rates. The age structure of the local population in oil-rich counties also begins to diverge from that of baseline counties after the discovery of oil fields, with the former becoming notably younger. Finally we also check whether oil wealth is associated with gender-biased immigration by assessing whether oil-rich counties exhibit substantial changes in their sex ratios after the discovery of oil, and find no evidence that this is the case. Thus, contrary to popular perception and anecdotal evidence based on short-run analyses [8], but in line with our working assumption of continously clearing marriage markets from the previous section, in our sample we observe no tendency for the gender ratio in oil counties to become skewed in favor of men. This might be interpreted as evidence that the impact of resource shocks on the gender composition of the local population, to the extent that it is present, is likely to be short lived and difficult to capture with relatively coarse decadal data.

Having established that oil discoveries have a substantial impact on counties' demographics, we proceed to check whether they also impact the counties' economic structure. Referring back to our discussion (see Section 3) of the potential mechanisms that may lead to major mineral discoveries having a gender biased impact on local labor markets (and in particular an adverse impact on women's labor market opportunities) it is important to note that most of them involve resource discoveries bringing about substantial changes in the sectoral composition of local economies. Thus, to keep our empirical analysis as close as possible to the theoretical frameworks that link oil to gender biased economic outcomes, we proceed to verify whether oil field discoveries can indeed be found to be associated with substantial structural transformation of local economies in our sample.

To perform this verification we run our baseline panel regressions (specification 1 in the previous section) with the share of the labor force[9] employed in each of the 4 major sectors of agriculture, oil extraction, manufacturing and services as the dependent variables. The results of this empirical exercise are detailed in Table 4

[8] See for example Sheerin and Bressanin (2014)

[9] Ideally we would have liked to run these specifications with the employment shares of each sector (i.e. employment in the sector in the county/ total employment in the county) as the outcome variables. However employment status data is missing in our sample for the years 1900 and 1920 such that operating with employment shares would substantially reduce our sample sizes. As a result we chose to run the regressions with the share of each sector in the overall labor force as the outcome variable (i.e. employment in the sector in the county/total number of people in the labor force in the county). Given that for the census years for which we observe both employment status and labor force status, employment always represents more than 90% of the labor force, this slight redefinition of the outcome variable should not substantively affect the interpretation of our results.

and reveal that oil discoveries seem to have had a notable impact on the sectoral composition of local economies. Our findings indicate that oil discoveries unsurprisingly lead to a sharp growth of oil extraction activities as a share of overall employment while agriculture experiences a corresponding decline. Indeed, it is interesting to note that virtually the entire relative growth of the oil extractive sector is accommodated by a relative decline of agriculture, with the manufacturing and service sectors growing only slightly.[10] We also detect some spillover effects from oil discoveries in neighboring counties, which largely go in the same direction as own-county discoveries, but are of substantially smaller magnitudes.

To summarize, our results indicate that oil discoveries present large shocks to the local economy, with oil extraction activities and to some extent manufacturing experiencing relative growth. Both of these broad sectors turn out to be relatively male-dominated: While women account for more than 15.6% of the overall labor force over our sample, their shares in manufacturing and oil extraction amount to only 1.3% and 10%, respectively. Moreover, within manufacturing, the sectors most connected to oil extraction by either supply or demand linkages (and which can be expected to grow in oil-rich counties after the discovery of oil[11]) also tend to employ relatively few women. Thus, the oil refining sector, the most closely related activity to oil extraction via forward linkages, draws only 6.5% of its labor force from among women, whereas glass products and fabricated metals, the first and second most closely linked sectors to oil extraction via backward linkages, exhibit shares of females in their overall employment of 6.3% and 4.2% respectively. Thus, our findings on the sectoral composition of the economy coupled with an informal analysis of employment shares provide suggestive evidence that oil discoveries may constitute a male-biased labor demand shock.

In light of our results so far, which indicate that some of the conditions required for oil discoveries to represent substantial male-biased shocks to local labor markets are met, we proceed to assess whether oil field discoveries can indeed be found to have a notable impact on measures of labor market participation by gender. Interestingly, this does not seem to be the case: While the male labor force participation seems to increase at least slightly in oil-rich counties, we do not observe any changes in female labor force participation. Similarly, we fail to

[10] When interpreting the results, it has to be borne in mind that these are sectoral shares of the total labor force. A positive coefficient thus means that a sector's employment grows faster than the total labor force. Our findings in Table 4 thus largely replicate those of Michaels (2011). Interestingly they reveal no evidence of the "Dutch Disease" in our sample. If anything manufacturing as well as services seem to benefit (even in relative terms) from the discovery of oil.

[11] The fact that sectors linked via backward and forward linkages to the resource sectors tend to benefit from resource shocks has already been established elsewhere (Black et al. 2005, Marchand 2012, Fetzer 2014)

identify any effect of oil discoveries on either the male or female employment rates. The respective point estimates are close to zero across all specifications (with or without controls), are never statistically significant and their signs are not robust to the introduction of controls. The results from this exercise suggest that there is no effect on the relative demand for female labor that is reflected in the quantities transacted in local labor markets, at least when one focuses on the extensive (i.e. participation) margin. Switching attention to the intensive margin, in Table 6, we study two measures of labor supply intensity, namely the number of weeks worked per year and the number of days worked per week. Due to data limitations, we are only able to assess the impact of oil wealth on these measures of labor supply on a cross-section for the year 1940. We proceed to estimate our cross-sectional specification (specification 2 in the previous section) and for the purposes of comparison we report regression results for both men and women. Again, we do not find any evidence supporting a differential change in female labor supply due to oil discoveries. For both measures employed, the coefficients are quite small and never statistically significant.

Thus, in contrast to the cross-country results of Ross (2008), we do not find evidence for a negative relationship between oil wealth and female labor market participation. However, as discussed in section 3, such a negative relationship crucially relies on two conditions. Firstly, labor markets have to be segregated by gender. Secondly there must not be any sector that is open to women and that is sufficiently large to absorb the excess female labor that may result from the shifting structure of the rest of the local economy. If such a sector exists and is not hurt (or is even helped) by the discovery of oil, the non-response of female labor force participation is to be expected. To assess this, in tables 7 and 8, we estimate the effect of oil discoveries on the weight of different sectors in female and male employment, respectively. In particular, we use each sector's employment share by gender as the outcome variable. Not surprisingly, we find that manufacturing and oil extraction grow as a share of male labor, while agriculture becomes a less important employer of men. For women, on the other hand, we find a reallocation from manufacturing and agriculture into services, with a very small and economically negligible increase in oil extraction. These findings are consistent with labor markets being partially segregated across gender lines and with oil discoveries representing a male-biased shock to labor demand within the manufacturing sector (e.g. due to more "male "industries growing particularly). However, while oil wealth thus seems to play a role in driving women out of manufacturing, it does not seem to drive them out of the labor force altogether. This is largely because oil discoveries are associated with a growing service sector that absorbs "excess "female labor. In this respect, our results provide evidence for the mechanism described qualitatively by Ross (2008): even if labor markets are segregated by gender and even if oil discoveries represent an initial male biased shock to local labor markets, it is sufficient for there to be one sector that is open to women and large enough to absorb "excess"female workers for oil not to notably hamper women's labor market involvement.

After studying the quantity side of labor markets, we move to assess whether oil abundance can be found to have any effect on local wage rates in oil-rich counties. We perform this assessment on a cross section of counties for the year 1940 by estimating our baseline cross-sectional regression (see specification 2 in the previous section). Our results are presented in Table 9, which in line with our previous analysis reports separate regression estimates of the effect of oil wealth on male and female wages for the purposes of comparison. Unlike our previous results on labor force participation and employment, we identify substantial effects of oil wealth on local wage rates, with average wages in oil-rich counties being over 32 log points higher relative to baseline counties after the discovery of oil. Interestingly, the benefits of oil field discovery in terms of higher wages seem to accrue mostly to men, whose wages are almost 36 log points higher in oil-rich counties than in comparable counties that do not have oil deposits (or have not yet discovered their oil field). There is also some evidence that women's wages are higher in oil-rich counties, with the point estimate indicating a female wage differential between oil-rich and baseline counties of some 11 log points. However, the coefficient on our variable of interest in the female wage regressions is not statistically significant. Taken together, our results point to a substantial widening of the gender wage gap in oil-rich counties, with the differential between the average male wage and the average female wage being 25 log points higher in oil-rich counties than in baseline counties in 1940.

Reconciling our labor force participation and employment rates results with the results of our wage regressions is not immediate. In particular it is surprising that the substantial wage gains observed for men in oil-rich counties do not seem to be reflected in either notably increased labor force participation and employment rates for men[12] (even in the most generous specifications the effect of oil abundance on the male labor force participation rate is at most 1 percentage point) or in increases in labor supply by employed men.[13] Our findings regarding women's

[12]This apparent inelasticity of the labor supply of men seems particularly surprising given the strong response we observe on the extensive margin represented by the immigration channel.

[13] Interpretation of our wage results has to be undertaken with care. In the main text we discuss the movements we observe in *nominal* wages, which may differ substantially from movements in real wages as a result of oil wealth. Indeed Michaels (2011) finds evidence of increasing prices of non-tradables (particularly rental rates) in oil-rich counties, which indicates that movements in real wages are likely to be of lower magnitude than movements in nominal wages. However, given that in our period of analysis (and even after) we observe substantial immigration into oil counties, the direction of movement of real wages and of the relative gap in real pay by gender are likely to be analogous to the corresponding movements observed for nominal wages.

labor market outcomes are somewhat easier to rationalize. From the perspective of the demand-side of labor markets, while we find some evidence that the employment structure of manufacturing moves against women, this effect seems to be balanced out by increasing opportunities for women in the service sector. On the supply-side of labor markets, our findings seem to indicate that, for women, the negative effect on labor force involvement that could ensue as a result of higher male wages may be compensated by the positive effect of increasing own wages, though admittedly the evidence in favor of higher female wages in oil-rich counties is only suggestive.

Taking stock of our finding that oil discoveries seem to be associated with a widening of the gender wage gap, and in light of the literature documenting a link between women's labor market success and other significant social outcomes, we next move to assess whether oil wealth can be found to have had any impact on women's marriage market outcomes in our sample. The key marriage market variables we investigate are women's likelihood to be married (the marriage rate), women's age at first marriage and fertility (measured as children ever born to a woman). To perform this analysis we rely on our baseline panel specification (specification 1 in the previous section) and report the results in Tables 10 and 11. Overall, our findings reveal no association between oil wealth and the female marriage market outcomes we study. Women in oil-rich counties are not more likely to be married than women in baseline counties. This negative finding presents some intrinsic interests of its own, as it offers some suggestive evidence against sociological theories that link marriage rates to the (local) supply of "marriageable"men (Darity and Myers 1995)[14]. In our context, we are able to identify a series of plausibly exogenous positive shocks to male earnings in oil-rich counties (and hence positive shocks to their marriageability) without finding any evidence of a corresponding increase in marriage rates.

Oil wealth also seems to have no impact on women's age at first marriage, which we interpret as negative evidence for the view that oil abundance raises the relative returns that women can derive from marriage markets as opposed to labor markets. Finally, we do find suggestive evidence for a negative association between oil wealth and average fertility. However, apart from not being statistically significant, this result also seems to be largely compositional and to be driven by the fact that oil wealth shifts the local age composition towards younger cohorts. Once we restrict analysis to the fertility of women aged over 40, any association between local oil abundance and fertility disappears.

All in all, the results of our analysis of the impact of oil wealth on women's

[14] Our failure to identify an effect of increases in male wages on the female marriage rates also stands in contrast with the findings of Buckley (2003), who finds a statistically significant association between male earnings and female marriage rates.

marriage market outcomes are largely consistent with our findings related to labor markets. As oil wealth shocks seem to have virtually no effect on measures of female involvement in labor markets in our sample, it is not very surprising, from the perspective of the class of theoretical frameworks that underpins this study, that they also seem to have little impact on women's marriage market outcomes. It is interesting to note, however, that our results concerning marriage markets seem to indicate the absence of notable effects ensuing from the widening of the gender pay gap in oil-rich counties.

6 Robustness Checks and Other Specifications

In this section, we implement a number of robustness checks that aim to provide further support for the notion that the effects we find are indeed caused by the discovery of major oil fields. Furthermore, some of the specifications that we estimate in this section serve to shed some light on the characteristics and timing of the transmission of oil shocks.

The first robustness check we perform involves exploiting the timing of oil field discoveries to verify more rigorously if our identifying assumption of common trends between oil and baseline counties before the discovery of oil fields holds. This check also has the added benefit of allowing us to study the timing of the transmission of oil shocks. To perform this verification we augment our baseline panel specification by replacing our variable of interest with a full set of leads and lags of the date of oil discovery relevant for each oil-rich county. The specification we estimate is thus of the form:

$$y_{ct} = \alpha_c + \tau_t + \sum_{j \in \{-30,-20,-10,10,20,30\}} \beta_j DiscoveredOilField_{c,t+j} + \eta NeighborOil_{ct} + X_c' \gamma_t + u_{ct} \quad (3)$$

where the set of dummies $DiscoveredOilField_{c,t+j}$ code for whether an oil field is to be discovered $20-30$ years from period t, $10-20$ years from period t, $10-0$ years from period t or was discovered $0-10$ years prior to period t, $10-20$ years prior to period t or more than 20 years prior to period t, with the omitted reference category being represented by discoveries that occur more than 30 years after the reference period t. All the remaining variables and controls retain their meanings from specification 1 in section 4. The results of estimating this leads and lags specification for a range of dependent variables are presented in Tables $12-14$.

Reassuringly, our results indicate that there is no evidence that oil-rich counties display systematically different characteristics before the discovery of oil, with virtually all the leading dummies (that indicate oil discoveries in the future) having no significant impact on any of our outcome variables of interest. The only potential threat to identification revealed by analyzing the coefficients on the leading terms of our leads and lags specification is represented by the fact that a small number of our variables of interest (average age of the male population, proportion of the male labor force employed in manufacturing) seem to display trends in oil-rich counties that pre-date the discovery of oil. However, these trends are of small magnitudes (notably smaller than the systematic differences in these variables that we observe between oil-rich and baseline counties after the discovery of oil) and are thus unlikely to be responsible for our findings.

The findings related to the lagging dummies (that indicate time elapsed since discovery) largely confirm the results from our main specifications in the previous section. Thus oil-rich counties become more populous, more urbanized and younger than baseline counties after the discovery of oil. For the case of population and the urbanization rate the effect of oil abundance seems to take some time to materialize fully, as differences between oil-rich and baseline counties with respect to these two variables seem to augment as more time elapses since the discovery of an oil field. In the case of the average age at the county level, the entire effect of oil abundance in tilting the age profile of the local population seems to be realized fully in the first decade after oil discovery.

Focusing on the impact of oil wealth on the structural composition of employment, we find some evidence that the substantial increase in the (relative) scale of employment in the oil extraction sector tends to die out as more time elapses since oil discoveries. This could reflect a number of factors including the exhausting of oil fields, the oil sector generally becoming more capital and less labor intensive as time elapses, or oil wealth bringing about growth in other sectors of the economy that take more time to materialize. The differential between oil-rich and baseline counties in terms of the proportion of the labor force employed in agriculture also appears after the discovery of oil and increases as time elapses since the discovery of oil. Coupled with our results on the evolution of the size of employment in the oil sector after oil discoveries, this provides further evidence that oil wealth tends to bring about the growth of sectors that are not directly linked with oil extraction. Finally differences between oil-rich and baseline counties in terms of the share of the male labor force employed in manufacturing also seem to emerge after the discovery of oil and to grow larger as time since oil discovery elapses. All in all, our results from the lead and lag analysis are consistent with the results emerging from our main specifications and support the view that the systematic differences we observe between oil-rich and baseline counties do indeed appear after oil discoveries and can be attributed to oil abundance in a causal way.

In light of our reassuring findings from the leads and lags analysis above we next move to exploit the variation in the size of oil fields observed in our sample. If oil wealth can indeed be shown to have some substantive effects on local economies and local labor markets, we may reasonably expect larger oil fields to be associated with larger such effects. To test this hypothesis we estimate the following empirical specification:

$$y_{ct} = \alpha_c + \tau_t + \beta_1 DiscoveredOilField_{ct} + \beta_2 DiscoveredOilField_{ct} * SizeOilField_c + \\ + \eta NeighborOilField_{ct} + X_c' \gamma_t + u_{ct} \quad (4)$$

where we add to our baseline panel specification a term that interacts the oil field discovery dummy with a variable containing the size of each oil field (measured per 100 million barrels). Our results are set out in Tables $15 - 17$ and when interpreting these results care has to be taken in recognizing the nonstandard nature of our intercept in this specification, as the inclusion of the $DiscoveredOilField_{ct}$ dummy in the regression already means that a county sits above a discovered oil field of at least 100 million barrels[15].

Our findings from this exercise are somewhat inconclusive, as the coefficients corresponding to terms that reflects the size of counties oil fields always have the expected signs but are most often not statistically significant. However, we do find substantial evidence that larger oil fields are associated with larger populations and a smaller involvement of the local labor force in agriculture, as well as suggestive evidence that counties with larger oil fields tend to have a somewhat larger share of their female labor force involved in manufacturing and a slightly higher marriage rate. We attribute our limited findings related to the remaining outcomes to the nonstandard specification of the intercept in our regression model and interpret our results as implying that once a county sits on top of a large oil field (interpreted in our specification as an oil field larger than 100 million barrels of oil) the impact of any incremental oil reserves is likely to be second order.[16]

The last robustness check we apply to the results of our baseline panel specification involves performing the estimation on a limited sample in which all counties without oil deposits are dropped from the analysis. This type of empirical exercise is quite demanding, as it involves deriving identification only from the time variation in oil field discoveries, as well as dropping more than three quarters of our observations. Our results are shown in Tables $18 - 20$. Overall, the findings of this robustness test provide a convincing validation of the results obtained from our baseline specification in the previous section: having a discovered oil field is

[15] This does not necessarily mean that the whole oil field accrues to the county, of course, since one oil field can lie below the surfaces of several counties

[16] The finding that incremental oil reserves above a high threshold may only have second order effects on local economies and local labor markets is straightforward to rationalize. Local economies are only likely to be affected by the flow of resources actually extracted and transacted, and this flow is unlikely to vary much above a certain (high) threshold of oil field size. Thus above a certain threshold of oil field size we may expect larger oil fields to be associated with longer resource booms, rather than larger magnitudes of the static impact of oil abundance.

found to be associated with a larger and younger local population, a greater urbanization rate, a lower share of the labor force involved in agriculture and a higher share involved in oil extraction activities. The different impact of oil wealth on the structural composition of employment for men and women is also confirmed in this alternative specification. Moreover, not only do all our findings from our baseline panel specification survive unqualified, but the point estimates of the coefficients obtained by estimating over this limited sample are very similar to those obtained in the previous section.

Finally, we perform three robustness checks on the results obtained from our baseline cross-sectional specification in the previous section. The first involves adding an additional dummy for "having an undiscovered oil field" to our baseline cross-sectional specification. The second robustness check includes the size of a discovered oil field as additional regressor and thus constitutes a cross-sectional version of tables $15-17$. Finally, we perform a placebo test: we drop all counties that have a discovered oil deposit from the analysis and replace our variable of interest from the baseline cross-sectional specification with the dummy variable that codes for "having an undiscovered oil field". We thus treat counties that have an undiscovered oil field as if they have discovered it- if the effects we have seen are indeed caused by oil discoveries, these placebo discoveries should not lead to any significant effects.

The results from these robustness specifications are presented in Tables $21-23$. Reassuringly, their results seem to validate our findings and interpretation from the previous section. Our wage results survive and only emerge in oil counties with an already discovered oil field, and we find at least suggestive evidence that the male wage results are stronger in counties with larger oil fields. Most importantly, in the third specification the "having an undiscovered oil field" dummy (i.e. the placebo treatment) is not found to have an effect on any of our outcomes of interest.

7 Concluding Remarks

In this paper we have sought to provide an extensive analysis of the effect of oil wealth on female labor market participation.

By making use of within country historical data on oil discoveries over an extended time period, we have been able to combine the benefits of more credible identification with the relevance and informativeness given by studying a setting that is not too dissimilar from the environment that prevails in some of today's resource rich developing countries.

Our empirical setting presents several substantial advantages over previous work investigating similar issues. Firstly, our study relies on a source of variation in resource abundance that is plausibly exogenous and not subject to endogeneity concerns that would arise in connection with measures of the amount of natural resources extracted. Combined with our difference-in-difference design, this provides a very clean source of identification. Focusing on a set of counties from the same country also helps us to address issues due to differences in institutions that are hard to control for in cross-country panels that previous studies have used. In our set-up, such institutional differences should be relatively small and not a major threat to identification. Finally, our particular set-up offers us the advantages of analysing consistent, high-quality data from a region that at that time still relied heavily on agriculture. This is important because much of the discussion surrounding the link between resource abundance and gender issues has concentrated on developing, often heavily agrarian economies

Contrary to previous studies (e.g. Ross 2008), we do not find a negative relationship between oil wealth and female labor force participation. While oil abundance is found to have substantial economic and demographic implications, which include shifting the sectoral composition of employment at the level of local economies, once we focus on our labor market outcomes of interest (labor force participation by gender, employment rates by gender) we fail to find any association between oil wealth and women's labor market success. Oil abundance is thus not associated with lower rates of female labor force participation at the county level or with depressed employment rates for women. The most likely explanation for this is a process of sectoral reallocation by gender, where women find ample employment opportunities in the service sector. Consistent with these findings concerning labor markets we also fail to identify any association between oil wealth and potentially malign marriage market outcomes for women: women in oil-rich counties were not getting married younger or displaying higher fertility levels than women in baseline counties, and were also not more likely to be married. The only evidence in favor of the notion that oil abundance may bring about a male-biased shock to local labor markets comes from the analysis of wage data, as we indeed find that oil wealth is associated with notably larger pay differentials between men and women at the county level. However, in light of our other findings concerning labor and marriage markets, this widening of the gender gap in oil-rich counties does not appear to be very consequential.

In our view, our findings show that while oil discoveries may, in the first instance, constitute a male-biased demand shock to local labor markets, this does not necessarily lead to worse labor market outcomes for women in the aggregate. As hypothesized by Ross (2008), the predicted link between resource abundance and adverse female outcomes is only likely to materialize in the absence of a sector that finds itself on the employment margin between hiring male or female labor and that is also sufficiently large to absorb the "excess" female labor that may result from a relative decline in the demand for female labor elsewhere in the economy due to the oil shock. In our setting, we observe a general boost to the local economy (also documented by Michaels 2011) with a corresponding increased demand for women in the service sector. Our inability to find any impact of oil wealth on most outcomes of interest can thus potentially be explained through the fact that in our sample the service sector expands and absorbs an increasing share of the female labor force in oil-rich counties in the wake of major oil field discoveries. The existence of such sectors and their openness towards women thus are a crucial determinant in whether the initial male-biased shock will actually end up hurting women's prospects. Furthermore, our findings seem to indicate that the circumstances in which such a sector is likely to be present are wider than previously thought. As a result, settings in which the entire set of conditions required for oil in itself to adversely impact women's labor market opportunities are likely to be rare.[17]

A somewhat broader implication of our finding is that an initial gender-biased shock does not necessarily lead to aggregate gender-biased outcomes. If such a shock has indirect effects on other sectors via income effects or backward and forward linkages, the initial gender-biased implications can easily be attenuated or even fully netted out.

Finally, our study leaves unanswered a series of important questions that could be productive to explore in further research. In the case of the labor market, while we explore the impact of oil wealth on the extensive and intensive margins of female involvement in the workplace, we did not investigate whether oil abundance can be found to have an impact on the "quality"of female employment. Given the notable shifts in the sectoral composition of employment that seem to be associated with oil wealth, it is theoretically possible that oil abundance may bring about situations in which women are marginalized into lower-paid, lower-status professions in the service sector. It would also be important to determine the conditions that lead to the transmission of the relative labor market demand shocks to operate almost exclusively through relative wages, without any discernible effects on the relative numbers of men and women involved in the labor market.

Another important question related to the line of enquiry explored in the

[17] Ross (2012), for example, named the case of the Southern US that we study as one in which all the conditions required for oil wealth to have a notable impact on female socioeconomic outcomes are likely to be fulfilled. As our results show, even in this potentially "ideal"context, there is no such clear adverse effect of oil on women's labor market participation. It may well be the case that oil wealth only has an adverse impact on women's labor market outcomes in settings in which their access to large sections of the labor market is restricted, perhaps due to institutional, cultural, religious or other factors. However, in such settings, it becomes a matter of interpretation whether resource wealth causes adverse outcomes for women, or is merely a secondary aggravating factor.

present paper is whether oil wealth can be found to have any impact on women's political involvement, particularly their propensity to vote and (later on) to stand for elected office. While previous studies from the political science literature have touched upon this issue, it would be interesting to further investigate this question in a sub-national setting that mitigates some of the potential threats to identification that affect previous studies.

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	(1)	(2)	(3)	(4)	(5)
VARIABLES	Ln(Pop)	Ratio Urban Pop	Mean Age Fem	Mean Age Male	Sex Ratio
DiscoveredOilField	0.256***	0.0426***	-0.811***	-0.590**	-0.0185
	(0.0592)	(0.0101)	(0.240)	(0.247)	(0.0165)
NeighborOil	0.0924**	0.0217***	-0.167	-0.403**	0.00611
	(0.0423)	(0.00700)	(0.148)	(0.172)	(0.0113)
Controls					
Observations	3,568	3,570	3,569	3,569	3,568
R-squared	0.966	0.964	0.672	0.619	0.476

All regressions control for county and year FE. Standard errors, clustered at the county level, in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 2: Impact of oil discoveries on some demographic variables, no controls

VARIABLES	(1) Ln(Pop)	(2) Ratio Urban Pop	(3) Mean Age Fem	(4) Mean Age Male	(5) Sex Ratio
DiscoveredOilField	0.221***	0.0388***	-0.878***	-0.638**	-0.00769
	(0.0622)	(0.0103)	(0.251)	(0.248)	(0.0152)
NeighborOil	0.00994	0.0118	-0.176	-0.339*	0.0154
	(0.0387)	(0.00771)	(0.176)	(0.193)	(0.0121)
Controls	X	X	X	X	X
Observations	3,568	3,570	3,569	3,569	3,568
R-squared	0.971	0.966	0.692	0.640	0.500

Controls described in text. All regressions control for county and year FE.
Standard errors, clustered at the county level, in parentheses.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 3: Impact of oil discoveries on some demographic variables, with controls

VARIABLES	(1) Oilshare	(2) Manushare	(3) Servshare	(4) Agrishare	(5) Oilshare	(6) Manushare	(7) Servshare	(8) Agrishare
DiscoveredOilField	0.0479***	0.00738	0.0124	-0.0755***	0.0479***	0.00625	0.0101	-0.0734***
	(0.00731)	(0.00522)	(0.00808)	(0.0225)	(0.00725)	(0.00519)	(0.00806)	(0.0217)
NeighborOil	0.0106***	0.00222	0.00604	-0.0200	0.00864***	0.00239	0.00176	-0.0152
	(0.00253)	(0.00427)	(0.00453)	(0.0143)	(0.00294)	(0.00444)	(0.00467)	(0.0141)
Controls					X	X	X	X
Observations	3,567	3,567	3,567	3,567	3,567	3,567	3,567	3,567
R-squared	0.736	0.799	0.818	0.928	0.744	0.807	0.824	0.930

Controls described in text. All regressions control for county and year FE.
Standard errors, clustered at the county level, in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Impact of oil discoveries on the sectoral composition of employment

VARIABLES	(1) Fem LF Part	(2) Fem Emp Rate	(3) Male LF Part	(4) Male Emp Rate	(5) Fem LF Part	(6) Fem Emp Rate	(7) Male LF Part	(8) Male Emp Rate
DiscoveredOilField	0.00293	-0.0239	0.00355	-0.00907	-0.00577	-0.0187	0.00323	-0.00746
	(0.0120)	(0.0197)	(0.00567)	(0.00998)	(0.0113)	(0.0198)	(0.00578)	(0.00984)
NeighborOil	0.0121	0.00760	0.00723**	-0.00291	-0.000165	0.0159	0.00755*	-0.00327
	(0.00770)	(0.0104)	(0.00358)	(0.00633)	(0.00852)	(0.0112)	(0.00397)	(0.00665)
Controls					X	X	X	X
Observations	3,569	2,132	3,569	2,237	3,569	2,132	3,569	2,237
R-squared	0.722	0.448	0.721	0.600	0.770	0.454	0.727	0.611

Controls described in text. All regressions control for county and year FE. Standard errors, clustered at the county level, in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 5: The impact of having a discovered oil field on the labor force participation rate and employment rate, by gender

	(1)	(2)	(3)	(4)
VARIABLES	Hours/week Fem	Hours/week Male	Weeks Fem	Weeks Male
DiscoveredOilField	0.210	-0.230	0.490	0.234
	(0.532)	(0.402)	(0.598)	(0.353)
NeighborOil	0.160	-0.0852	0.745	0.180
	(0.520)	(0.320)	(0.633)	(0.263)
Observations	730	761	740	761
R-squared	0.096	0.253	0.081	0.119

Controls described in text. Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: The impact of having a discovered oil field on measures of labor supply, by gender

VARIABLES	(1) Prop F oil	(2) Prop F manu	(3) Prop F serv	(4) Prop F agri	(5) Prop F oil	(6) Prop F manu	(7) Prop F serv	(8) Prop F agri
DiscoveredOilField	0.00171**	-0.0139	0.0596*	-0.0549*	0.00152**	-0.0113	0.0548*	-0.0525
	(0.000704)	(0.00862)	(0.0315)	(0.0328)	(0.000720)	(0.00891)	(0.0324)	(0.0333)
NeighborOil	0.000265	-0.00763	0.00728	-0.000154	0.000126	-0.00604	-0.00122	0.00796
	(0.000405)	(0.00548)	(0.0198)	(0.0209)	(0.000440)	(0.00593)	(0.0224)	(0.0246)
Controls					X	X	X	X
Observations	3,368	3,368	3,368	3,368	3,368	3,368	3,368	3,368
R-squared	0.559	0.518	0.548	0.789	0.563	0.525	0.572	0.801

Controls described in text. All regressions control for county and year FE. Standard errors, clustered at the county level, in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Impact of oil discoveries on the sectoral composition of employment, women

VARIABLES	(1) Prop M oil	(2) Prop M manu	(3) Prop M serv	(4) Prop M agri	(5) Prop M oil	(6) Prop M manu	(7) Prop M serv	(8) Prop M agri
DiscoveredOilField	0.0575***	0.0121*	0.000631	-0.0767***	0.0574***	0.00940	-0.000155	-0.0741***
	(0.00846)	(0.00653)	(0.00559)	(0.0212)	(0.00840)	(0.00610)	(0.00563)	(0.0203)
NeighborOil	0.0123***	0.00431	0.00591*	-0.0241*	0.00991***	0.00360	0.00438	-0.0194
	(0.00286)	(0.00528)	(0.00326)	(0.0136)	(0.00329)	(0.00530)	(0.00350)	(0.0132)
Controls					X	X	X	X
Observations	3,568	3,568	3,568	3,568	3,568	3,568	3,568	3,568
R-squared	0.746	0.800	0.765	0.928	0.754	0.810	0.770	0.929

Controls described in text. All regressions control for county and year FE. Standard errors, clustered at the county level, in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Impact of oil discoveries on the sectoral composition of employment, men

VARIABLES	(1) logavgwage	(2) logwageratio	(3) logmalewage	(4) logfemalewage
DiscoveredOilField	0.324***	0.252***	0.356***	0.105
	(0.0923)	(0.0584)	(0.103)	(0.0872)
NeighborOil	0.0307	0.0212	0.0346	0.0105
	(0.0997)	(0.0612)	(0.112)	(0.0884)
Observations	762	722	760	724
R-squared	0.306	0.105	0.278	0.215

Controls described in text. Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 9: The impact of having a discovered oil field on wages, by gender

VARIABLES	(1) Marriagerate	(2) Fem Age at 1st Marriage	(3) Children ever born	(4) Children ever born, women over40
DiscoveredOilField	0.000363	-0.0761	-0.140	-0.0300
	(0.00723)	(0.407)	(0.122)	(0.210)
NeighborOil	-0.00305	0.299	-0.0934	-0.0310
	(0.00547)	(0.250)	(0.0807)	(0.131)
Observations	3,567	1,524	2,034	1,976
R-squared	0.588	0.700	0.855	0.845

All regressions control for county and year FE. Standard errors, clustered at the county level, in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 10: The impact of having a discovered oil field on women's marriage market outcomes, no controls

VARIABLES	(1) Marriagerate	(2) Fem Age at 1st Marriage	(3) Children ever born	(4) Children ever born, women over40
DiscoveredOil Field	0.00162	-0.0836	-0.130	0.0249
	(0.00752)	(0.336)	(0.117)	(0.209)
NeighborOil	0.00116	0.343	-0.0793	0.0817
	(0.00529)	(0.240)	(0.0901)	(0.149)
Observations	3,567	1,524	2,034	1,976
R-squared	0.604	0.703	0.860	0.851

Controls described in text. All regressions control for county and year FE.
Standard errors, clustered at the county level, in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 11: The impact of having a discovered oil field on women's marriage market outcomes, with controls

VARIABLES	(1) Ln(Pop)	(2) Ratio Urban Pop	(3) Mean Age Fem	(4) Mean Age Male	(5) Sex Ratio	(6) Oilshare	(7) Manushare	(8) Servshare
twentythirtyprior	-0.0725	-0.0156	0.112	0.481	-0.0125	0.00277	-0.00212	0.00101
	(0.0626)	(0.0107)	(0.294)	(0.315)	(0.0246)	(0.00319)	(0.00586)	(0.00994)
tentwentyprior	-0.0366	-0.0165	-0.344	0.104	-0.0238	-0.00221	-0.00810	-0.00188
	(0.0798)	(0.0121)	(0.293)	(0.370)	(0.0279)	(0.00404)	(0.0100)	(0.0110)
tenprior	-0.0663	-0.0113	-0.00706	0.157	-0.0487*	-0.00617	-0.00149	-0.0155
	(0.0939)	(0.0158)	(0.361)	(0.388)	(0.0291)	(0.00558)	(0.0109)	(0.0115)
ten	0.110	0.0179	-1.072***	-0.520	-0.0175	0.0475***	-0.00296	-0.00679
	(0.106)	(0.0176)	(0.387)	(0.400)	(0.0288)	(0.00925)	(0.0101)	(0.0126)
tentwenty	0.222*	0.0333*	-0.841*	-0.282	-0.0824**	0.0411***	0.00969	0.0161
	(0.119)	(0.0197)	(0.457)	(0.487)	(0.0368)	(0.00879)	(0.0116)	(0.0140)
twentyplus	0.469***	0.0578**	-0.839*	-0.687	-0.0668	0.0283***	0.0198	0.00941
	(0.170)	(0.0254)	(0.492)	(0.544)	(0.0507)	(0.0109)	(0.0138)	(0.0192)
NeighborOil	0.0200	0.0129*	-0.174	-0.354*	0.0168	0.00841***	0.00283	0.00228
	(0.0393)	(0.00781)	(0.177)	(0.193)	(0.0120)	(0.00303)	(0.00452)	(0.00499)
Observations	3,568	3,570	3,569	3,569	3,568	3,567	3,567	3,567
R-squared	0.972	0.966	0.693	0.641	0.503	0.747	0.808	0.825

All regressions include the controls described in the text and county and year FE. Standard errors, clustered at the county level, in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 12: Leads and Lags analysis, part 1

VARIABLES	(1) Agrishare	(2) Prop M oil	(3) Prop M manu	(4) Prop M serv	(5) Prop M agri	(6) Prop F oil	(7) Prop F manu	(8) Prop F serv
twentythirtyprior	0.0151	0.00292	-0.00103	0.00937	0.0136	0.000278	-0.0114	-0.0294
	(0.0200)	(0.00369)	(0.00701)	(0.00809)	(0.0187)	(0.000406)	(0.00877)	(0.0486)
tentwentyprior	0.0212	-0.00263	-0.00842	0.00528	0.0241	-0.000547	-0.0108	-0.0177
	(0.0250)	(0.00472)	(0.0111)	(0.00747)	(0.0213)	(0.000398)	(0.0120)	(0.0689)
tenprior	0.0301	-0.00721	-0.00301	-0.00521	0.0312	0.000157	-0.00291	-0.0412
	(0.0262)	(0.00651)	(0.0124)	(0.00874)	(0.0236)	(0.00127)	(0.0161)	(0.0639)
ten	-0.0392	0.0558***	-0.00304	-0.00479	-0.0377	0.00112	-0.0128	0.0129
	(0.0320)	(0.0107)	(0.0120)	(0.00910)	(0.0288)	(0.000963)	(0.0137)	(0.0711)
tentwenty	-0.0628*	0.0511***	0.0159	0.00913	-0.0631*	0.00153	-0.0274	0.0471
	(0.0360)	(0.0105)	(0.0136)	(0.0111)	(0.0328)	(0.00130)	(0.0167)	(0.0747)
twentyplus	-0.0671	0.0353***	0.0285*	0.00992	-0.0727**	0.00604*	-0.0250	-0.0289
	(0.0412)	(0.0128)	(0.0161)	(0.0129)	(0.0366)	(0.00351)	(0.0183)	(0.0902)
NeighborOil	-0.0165	0.00965***	0.00421	0.00470	-0.0209	0.000256	-0.00602	-0.00186
	(0.0146)	(0.00339)	(0.00538)	(0.00360)	(0.0136)	(0.000420)	(0.00606)	(0.0236)
Observations	3,567	3,568	3,568	3,568	3,568	3,368	3,368	3,368
R-squared	0.930	0.756	0.811	0.772	0.930	0.568	0.526	0.574

All regressions include the controls described in the text and county and year FE. Standard errors, clustered at the county level, in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 13: Leads and Lags analysis, part 2

VARIABLES	(1) Prop F agri	(2) Fem LF Part	(3) Fem Emp Rate	(4) Male LF Part	(5) Male Emp Rate	(6) Marriagerate
twentythirtyprior	0.0294	-0.0161	0.0199	-0.00975	0.0205	0.0143
	(0.0424)	(0.0194)	(0.0202)	(0.00694)	(0.0138)	(0.0103)
tentwentyprior	-0.00574	0.00330	0.00127	0.00284	0.0287*	0.000882
	(0.0629)	(0.0278)	(0.0280)	(0.00842)	(0.0170)	(0.0117)
tenprior	0.0282	0.00744	0.00196	0.0132	0.0369**	-0.00902
	(0.0585)	(0.0274)	(0.0316)	(0.00888)	(0.0172)	(0.0123)
ten	-0.0330	-0.00445	-0.0145	0.0102	0.0265	-0.000555
	(0.0654)	(0.0285)	(0.0316)	(0.00898)	(0.0175)	(0.0128)
tentwenty	-0.0434	-0.00372	-0.0114	0.00790	0.0199	0.000661
	(0.0704)	(0.0308)	(0.0326)	(0.0107)	(0.0202)	(0.0148)
twentyplus	-0.00273	0.0103	-0.0343	0.00299	0.0152	-0.00107
	(0.0823)	(0.0348)	(0.0373)	(0.0129)	(0.0217)	(0.0192)
NeighborOil	0.00814	7.45e-06	0.0154	0.00698*	-0.00485	0.00141
	(0.0254)	(0.00881)	(0.0115)	(0.00397)	(0.00686)	(0.00533)
Observations	3,368	3,569	2,132	3,569	2,237	3,567
R-squared	0.801	0.771	0.455	0.728	0.614	0.605

All regressions include the controls described in the text and county and year FE.
Standard errors, clustered at the county level, in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 14: Leads and Lags analysis, part 3

VARIABLES	(1) Ln(Pop)	(2) Ratio Urban Pop	(3) Mean Age Fem	(4) Mean Age Male	(5) Sex Ratio	(6) Oilshare	(7) Manushare	(8) Servshare
DiscoveredOilField	0.120	0.0293**	-0.901***	-0.559*	-0.0113	0.0394***	0.000512	0.00782
	(0.0738)	(0.0138)	(0.335)	(0.302)	(0.0203)	(0.00801)	(0.00659)	(0.00984)
discoveredXsize	0.0264**	0.00247	0.00591	-0.0207	0.000936	0.00223	0.00150	0.000585
	(0.0134)	(0.00219)	(0.0482)	(0.0502)	(0.00278)	(0.00197)	(0.00105)	(0.00161)
NeighborOil	0.00430	0.0112	-0.177	-0.335*	0.0152	0.00816***	0.00207	0.00164
	(0.0384)	(0.00774)	(0.177)	(0.194)	(0.0122)	(0.00286)	(0.00446)	(0.00467)
Observations	3,568	3,570	3,569	3,569	3,568	3,567	3,567	3,567
R-squared	0.971	0.966	0.692	0.640	0.500	0.746	0.808	0.824

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

Table 15: Regressions exploiting oil field size, part 1

VARIABLES	(1) Agrishare	(2) Prop M oil	(3) Prop M manu	(4) Prop M serv	(5) Prop M agri	(6) Prop F oil	(7) Prop F manu	(8) Prop F serv
DiscoveredOilField	-0.0430*	0.0476***	0.00700	-0.00392	-0.0423**	-0.000328	-0.0351***	0.0520
	(0.0225)	(0.00944)	(0.00785)	(0.00693)	(0.0213)	(0.000800)	(0.0105)	(0.0371)
discoveredXsize	-0.00795**	0.00255	0.000626	0.000984	-0.00831**	0.000489*	0.00631***	0.000742
	(0.00359)	(0.00232)	(0.00119)	(0.00104)	(0.00351)	(0.000280)	(0.00235)	(0.00632)
NeighborOil	-0.0135	0.00936***	0.00346	0.00417	-0.0177	2.39e-05	-0.00736	-0.00138
	(0.0140)	(0.00319)	(0.00532)	(0.00351)	(0.0131)	(0.000453)	(0.00589)	(0.0224)
Observations	3,567	3,568	3,568	3,568	3,568	3,368	3,368	3,368
R-squared	0.931	0.755	0.810	0.770	0.930	0.565	0.527	0.572

All regressions include the controls described in the text and county and year FE. Standard errors, clustered at the county level, in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 16: Regressions exploiting oil field size, part 2

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Prop F agri	Fem LF Part	Fem Emp Rate	Male LF Part	Male Emp Rate	Marriagerate
DiscoveredOilField	-0.0293	-0.0134	-0.0255	0.00753	-0.00513	-0.00865
	(0.0362)	(0.0140)	(0.0232)	(0.00802)	(0.0131)	(0.0103)
discoveredXsize	-0.00616	0.00199	0.00195	-0.00112	-0.000645	0.00268*
	(0.00547)	(0.00180)	(0.00473)	(0.00139)	(0.00172)	(0.00158)
NeighborOil	0.00925	-0.000590	0.0155	0.00779*	-0.00313	0.000588
	(0.0246)	(0.00858)	(0.0111)	(0.00399)	(0.00660)	(0.00534)
Observations	3,368	3,569	2,132	3,569	2,237	3,567
R-squared	0.801	0.771	0.455	0.727	0.611	0.604

All regressions include the controls described in the text and county and year FE.
Standard errors, clustered at the county level, in parentheses.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 17: Regressions exploiting oil field size, part 3

VARIABLES	(1) Ln(Pop)	(2) Ratio Urban Pop	(3) Mean Age Fem	(4) Mean Age Male	(5) Sex Ratio	(6) Oilshare	(7) Manushare	(8) Servshare
DiscoveredOilField	0.0926	0.0255**	-0.902***	-0.579*	0.0197	0.0469***	0.00229	0.00587
	(0.0673)	(0.0122)	(0.299)	(0.349)	(0.0226)	(0.00895)	(0.00734)	(0.00814)
NeighborOil	0.0691	0.0133	0.0494	-0.275	0.0265	0.0133	-0.00112	-0.00422
	(0.0726)	(0.0157)	(0.272)	(0.293)	(0.0301)	(0.00835)	(0.00760)	(0.00847)
Observations	757	757	757	757	757	756	756	756
R-squared	0.956	0.951	0.587	0.505	0.493	0.735	0.846	0.808

All regressions include the controls described in the text and county and year FE. Standard errors, clustered at the county level, in parentheses.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 18: Results when dropping all counties without an oil deposit, part 1

VARIABLES	(1) Agrishare	(2) Prop M oil	(3) Prop M manu	(4) Prop M serv	(5) Prop M agri	(6) Prop F oil	(7) Prop F manu	(8) Prop F serv
DiscoveredOilField	-0.0533**	0.0553***	0.00302	-0.00315	-0.0530**	0.000143	-0.00346	0.0521
	(0.0227)	(0.0103)	(0.00838)	(0.00636)	(0.0223)	(0.00138)	(0.0111)	(0.0392)
NeighborOil	-0.00872	0.0153*	0.00201	0.00168	-0.0164	-0.000126	-0.0151	-0.0175
	(0.0242)	(0.00916)	(0.00857)	(0.00761)	(0.0253)	(0.00106)	(0.0101)	(0.0358)
Observations	756	756	756	756	756	691	691	691
R-squared	0.909	0.745	0.855	0.749	0.906	0.707	0.518	0.559

All regressions include the controls described in the text and county and year FE. Standard errors, clustered at the county level, in parentheses.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 19: Results when dropping all counties without an oil deposit, part 2

VARIABLES	(1) Prop F agri	(2) Fem LF Part	(3) Fem Emp Rate	(4) Male LF Part	(5) Male Emp Rate	(6) Marriagerate
DiscoveredOilFeld	-0.0474	-0.0120	-0.0195	-0.00324	-0.0134	0.00210
	(0.0357)	(0.0142)	(0.0212)	(0.00771)	(0.0152)	(0.00975)
NeighborOil	0.0291	0.00542	0.0299	0.00310	-0.00896	0.00635
	(0.0305)	(0.0137)	(0.0212)	(0.00721)	(0.0145)	(0.0110)
Observations	691	757	449	757	484	756
R-squared	0.779	0.716	0.485	0.681	0.613	0.584

All regressions include the controls described in the text and county and year FE.
Standard errors, clustered at the county level, in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 20: Results when dropping all counties without an oil deposit, part 3

VARIABLES	(1) logavgwage	(2) logmalewage	(3) logfemalewage	(4) Hours/week Fem	(5) Hours/week Male	(6) Weeks Fem	(7) Weeks Male
DiscoveredOilField	0.314***	0.346***	0.0984	0.277	-0.169	0.859	0.340
	(0.0911)	(0.103)	(0.0833)	(0.514)	(0.380)	(0.591)	(0.348)
NotYetDiscovered	-0.156	-0.170	-0.0781	0.0894	0.683	0.815	0.324
	(0.131)	(0.145)	(0.123)	(0.791)	(0.535)	(0.695)	(0.411)
Observations	762	760	724	730	761	740	761
R-squared	0.309	0.281	0.216	0.096	0.255	0.080	0.120

Controls described in text. Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 21: First cross-sectional robustness check, adding a "has undiscovered oil field" dummy

VARIABLES	(1) logavgwage	(2) logmalewage	(3) logfemalewage	(4) Hours/week Fem	(5) Hours/week Male	(6) Weeks Fem	(7) Weeks Male
DiscoveredOilField	0.249**	0.265**	0.145	-0.162	-0.212	1.072	0.251
	(0.100)	(0.114)	(0.0908)	(0.743)	(0.428)	(0.804)	(0.394)
discoveredXsize	0.0151	0.0187	-0.0108	0.102	0.00997	-0.0495	0.0208
	(0.0120)	(0.0137)	(0.0124)	(0.147)	(0.0675)	(0.138)	(0.0625)
NotYetDiscovered	-0.155	-0.168	-0.0790	0.0983	0.684	0.810	0.326
	(0.131)	(0.146)	(0.123)	(0.791)	(0.535)	(0.696)	(0.411)
Observations	762	760	724	730	761	740	761
R-squared	0.311	0.283	0.216	0.097	0.255	0.080	0.120

Controls described in text. Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 22: Second cross-sectional robustness check, exploiting oil field size and adding a "has undiscovered oil field" dummy

VARIABLES	(1) logavgwage	(2) logmalewage	(3) logfemalewage	(4) Hours/week Fem	(5) Hours/week Male	(6) Weeks Fem	(7) Weeks Male
NotYetDiscovered	-0.164	-0.180	-0.0852	0.113	0.600	0.914	0.285
	(0.134)	(0.149)	(0.126)	(0.773)	(0.561)	(0.717)	(0.424)
Observations	648	646	617	620	647	629	647
R-squared	0.270	0.243	0.221	0.098	0.284	0.091	0.157

Controls described in text. Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 23: Third cross-sectional robustness check, using the “has undiscovered oil field”dummy to perform a placebo test

Annex 1: Figures

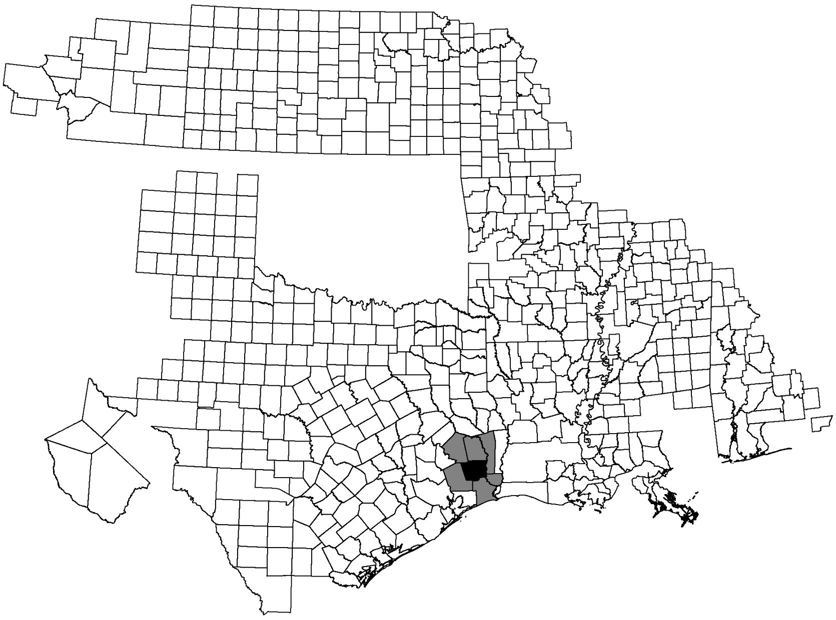

Figure 2: Map of Oil Discoveries 1900

Note: Oil abundant counties (black), Neighbors of oil abundant counties (grey), Other counties (white)

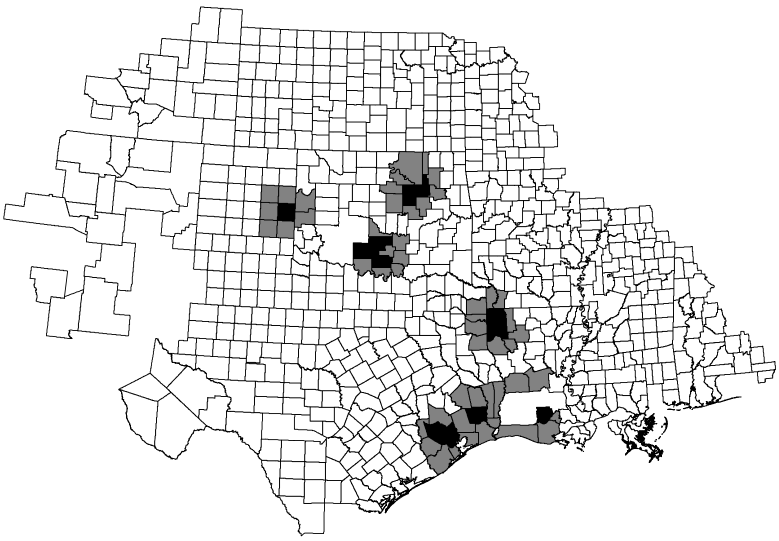

Figure 3: Map of Oil Discoveries 1910

Note: Oil abundant counties (black), Neighbors of oil abundant counties (grey), Other counties (white)

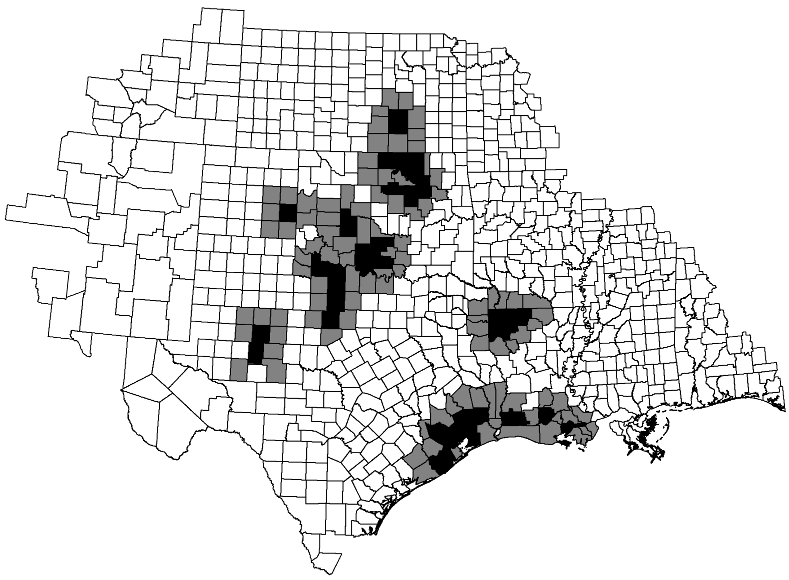

Figure 4: Map of Oil Discoveries 1920

Note: Oil abundant counties (black), Neighbors of oil abundant counties (grey), Other counties (white)

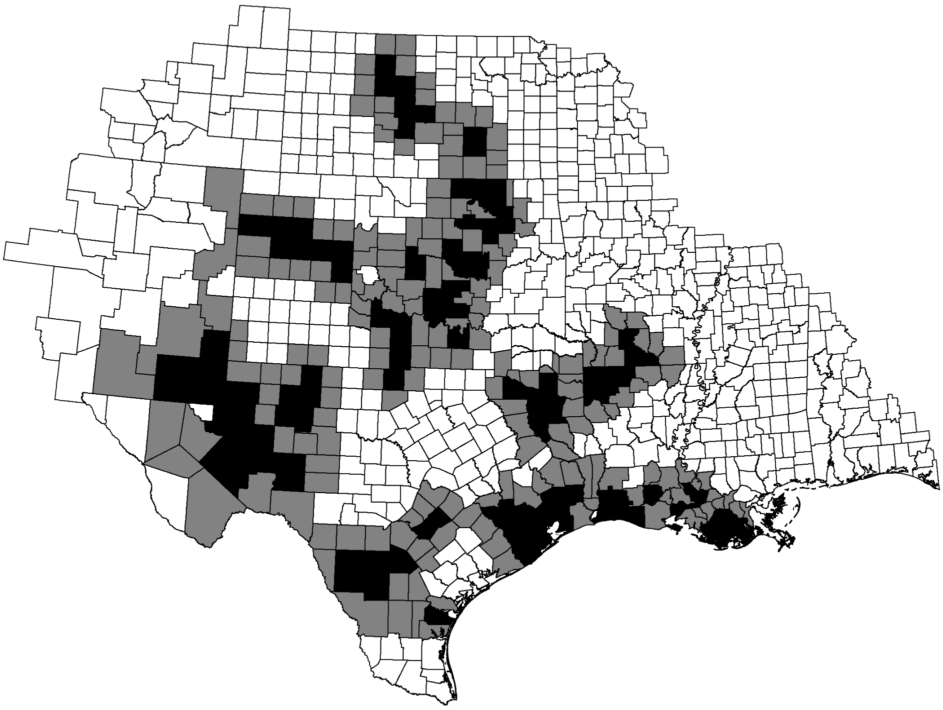

Figure 5: Map of Oil Discoveries 1930

Note: Oil abundant counties (black), Neighbors of oil abundant counties (grey), Other counties (white)

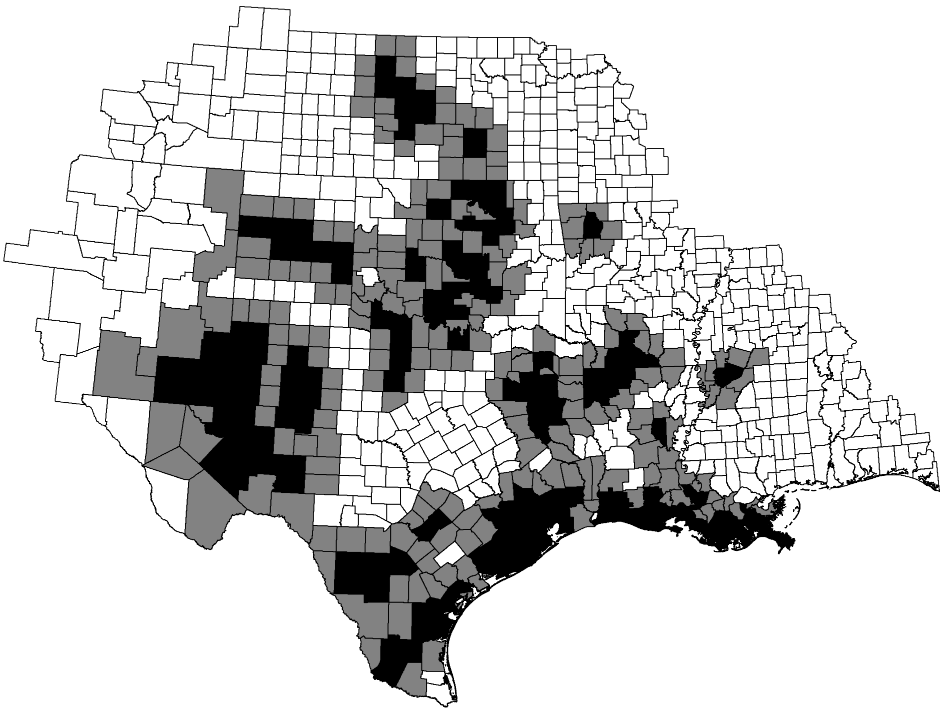

Figure 6: Map of Oil Discoveries 1940

Note: Oil abundant counties (black), Neighbors of oil abundant counties (grey), Other counties (white)

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